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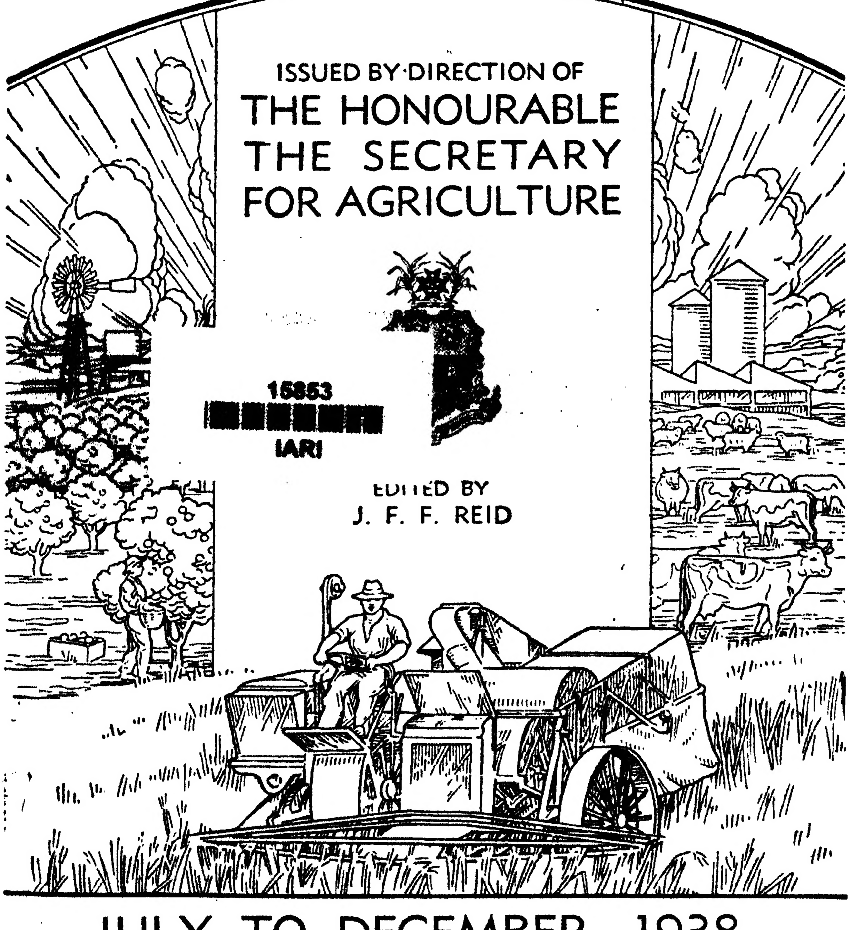

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Event and Comment

Agricultural Development in the North.

IN opening the Mackay Show, the Premier, Hon. W. Forgan Smith, LL.D., said that no district that he knew of could excel Mackay in its rapidity of development and the increase in population and real wealth production. Real wealth was the result of human effort applied to the natural resources and the potential wealth of the country was bound up indissolubly with its people and their industry and capacity to carry on. In that respect Mackay stood pre-eminent in all the qualifications he had mentioned.

The Premier said that the remarkable progress in the development of the rich agricultural areas of Mackay, especially during the last 20 years, was a striking tribute to the splendid pioneers to whose courage, industry, and resource the district owed much. For instance, the area of land under crop had advanced from 42,339 acres in 1916, the year he had first opened the Show, to approximately 95,000 acres last year. The area under cane had advanced from 41,611 acres in 1916 to 92,007 acres in 1936. The area harvested in 1937 totalled 67,958 acres, and in 1936 the total was 64,675 acres. The quantity of sugar-cane crushed in 1916 was 321,965 tons as compared with 948,139 tons in 1937.

In 1916 there were 35,143 tons of sugar made as against 148,047 tons in 1937. The value of the cane produced in the Petty Sessions district of Mackay for 1937 was £1,620,000 and of sugar £2,248,000. That, he added, represented a very great increase in material wealth.

production in the sugar industry alone. It also showed the development brought about, principally as a result of public policy over the twenty-three years of which he had been speaking. Progress also was indicated in other directions. In 1917 there were 87,279 cattle in the Mackay district as compared with 159,026 in 1936. In 1931 there were 982 dairy farms and in 1936 there were 1,234. The number of dairy cows had increased from 7,431 in 1931 to 13,474 in 1936. Butter production had increased from 288,794 lb. in 1931 to 597,892 lb. in 1936. New lands had been opened up for dairying, and keen interest was being taken in the improvement of grass lands and fodder conservation in the form of silage and winter and summer growing crops. The growing of English potatoes and onions also was receiving attention.

The tobacco industry was one that also showed promise, and since its commencement in the district marked progress had been shown. For the current season, it was anticipated that the crop would yield 120,000 lb. from 253 acres. The fruit and vegetable exhibits showed remarkable possibilities.

The Premier went on to say that he wished to comment on the fact that they had very fine representatives in the live-stock exhibits. The horses were probably the best in quality he had seen for many years in Mackay, while the cattle parade indicated the growing importance of the dairying industry. It showed that they realise the value and importance of high quality well-bred stock. Good breeding and scientific feeding formed the basis of success in any dairying enterprise. He also noticed that the pig industry was coming into prominence, and though the exhibits were not large in number the quality was high.

"There is a great future for the pork industry. Not only is there a market in Australia, but a large overseas market is available, so I look forward to the growth of the dairying industry side by side with the growing of pork to be converted into various products."

Referring to the sugar industry, he remarked, "I also am naturally interested in the exhibits of sugar-cane. An inspection of the exhibits caused me to reflect upon the history of the present method of paying for sugar-cane. I can remember when the question of payment by analysis was just as keenly contested as the various schemes that have been put forward to deal with the peak year problem to-day.

"That, like other problems, can only be settled in one way; that is the right way."

"No one to-day," he proceeded, " would ever dream of going back to the old method of selling cane by weight, and weight only, so that having solved that problem, it is an indication of our capacity and determination to solve all others and take them in our stride as we go along."

In conclusion, Mr. Forgan Smith said he wished to stress the fact that difficulties had been encountered in all periods of history, and that each age had its own problems. Every generation was called upon to do its own share of pioneering and if they were going to be worthy citizens of the great Commonwealth of Australia they would have to face manfully all their difficulties. They would have to use their intelligence and sober common sense and so help in the development of the great Commonwealth yet to be. Those things had been done in the past and were being done at present. He had every confidence that if after the next

twenty-three years he was called upon to open the Show he would be able to bring under review even a greater increase than he had indicated over the past generation.

The Dairy Industry.

SURVEYING the position of the dairy industry in the course of his opening address at the annual conference of the Australian Institute of Dairy Factory Managers and Secretaries, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that there had been material improvement in practice, in technique, and in the economic stability and security of the industry. So far as the overseas market position was concerned, the quality question was the most important one that confronted the industry, and as a result of improvements in qualities Australia had been placed in a good position in regard to the trade negotiations which were now taking place in London.

Speaking particularly of the position in Queensland, the Minister said that in January, 1936, this State produced about half its total volume of butter as choice. In May, 1938, the State, out of 81 per cent. of the butter which went to the graders, produced 77·86 per cent. of choice grade. If Queensland could hold that percentage its position on the markets of the United Kingdom was reasonably secure.

Striking a note of criticism of the factories, the Minister recalled that in the drive for quality a differential payment basis for cream was laid down after conferences had been held, but for a variety of reasons many factories had departed from that basis. As a result the position to-day was not nearly so satisfactory as it was in the early days after the system had been introduced.

The Minister went on to say that during recent years he had seen the very negation of co-operation in this State. He had seen co-operation in name but not in practice. There were two or three phases of this co-operation to which they should direct their attention to see if they could make it a truly co-operative movement for the industry, and not for the individual or group.

"One of the greatest difficulties I have to contend with is this insenate striving for the other fellow's supply," said the Minister. He had passed a Cream Transport Act, which, in effect, was designed to secure to individual factories continuity of supplies and to do away with roving suppliers who were always a threat to the industry. Yet he had been informed from reputable sources that some organisations were not keeping their contractors up to the terms of their contracts. He suggested that attention be given to the observation of the conditions of contract.

"We set out to give every area an economic supply," said Mr. Bulcock. "In the main that was achieved, but having done that surely it would be reasonable to ask factories which have territory vested in them to make the most of that territory."

Mr. Bulcock said that a committee which had been inquiring into the cheese industry had stated that certain alterations in practice were necessary if the industry were to be built up on a lucrative basis. He asked the cheese industry to give very careful consideration to the position and to co-operate with him in an endeavour to put it on a level keel and on the right course.

Further Experiments on Mildew Prevention in Calico with Special Reference to Tobacco Seed-bed Covers.

T. McKNIGHT, Assistant to Research Officer.

WITH the vapour treatment of tobacco seedlings, necessitating the use of calico tents, came a greater appreciation of the need for a simple and effective means for preventing the darkening and destruction of calico due to mildew. As an outcome of this initial experiments were carried out in 1937, with the result that alum-lead acetate and Shirlan treatments were provisionally recommended.* Certain proprietary dressings, however, were not included in these experiments and it was to test these, to investigate more thoroughly other processes already tried, and to ascertain whether it was possible to improve or to cheapen the methods already recommended, that the work now under review was commenced. The advice and assistance of Mr. T. H. Simmonds, Senior Research Officer, is acknowledged.

Procedure.

Sixteen treatments in all were tested, observations on the mildew development being supplemented by determinations of the waterproofing qualities and the resultant strength of the calico in the case of each treatment. Two field trials were carried out, one at Mareeba where three seed-beds 17 feet in length were available and one at Bowen with a seed-bed 51 feet in length. A third trial was instituted in Brisbane where the treated calico was used to cover cold frames instead of as tents.

For the field trials at Bowen and Mareeba only seven of the more promising treatments were tested. Strips of heavy calico approximately 2 feet in width were treated and sewn together to form the complete covers. In this way three separate covers 17 feet in length were prepared for the Mareeba experiment, each being located on a different farm. A composite cover 51 feet in length was made for Bowen, consisting of three component covers in each of which occurred the seven treatments and two controls. In each instance a randomisation of the treatments was made. Officers of the Agricultural Branch were responsible for arranging for these covers to be used on seed-beds on suitable farms.

In the Brisbane trial fourteen treatments and two controls were included. The facilities available permitted of two series, each of the treatments and controls occurring once in each series. Cold frames, 3 feet 3 inches square, were used allowing four different treatments to each frame. The time of exposure embraced summer and autumn months and included periods of considerable rainfall.

In all treatments, with the exception of the proprietary products where the method of application was in accordance with the instructions accompanying the preparations, the procedure adopted was to immerse the strips of calico of the requisite dimensions in the solutions prepared and to knead them until the fabric was thoroughly wetted. The time of immersion was ten minutes in all cases other than the alum-lead acetate treatments when the calico was allowed to remain immersed in

* Simmonds, J. H. and L. F. Mandelson: The Treatment of Tobacco Seed-bed Covers to Prolong their Useful Life. Queensland Agr. Journ., XLVIII., 2, 112-115, 1937.

the solution for twenty-four hours. On removal from the solution surplus liquid was removed and the calico hung up in a suitable position to dry.

Treatments.

With the exception of Shirlan none of the five proprietary products tested proved satisfactory for the purpose required. A solution of gelatin, soap and alum was also unsatisfactory and gave inconsistent results. Accordingly these treatments need not be referred to further.

Shirlan was given a more extensive trial than in previous experiments, Shirlan W.S. being used at the strengths of 1 per cent. and 0.25 per cent. and Shirlan AG. at the strength of 1 per cent.

The standard schedule for the alum-lead acetate process was included, this involving the preparation of two solutions with separate immersions, as previously recommended (loc. cit.). Modifications of this include combining the two solutions with and without the addition of glue size, both of which are based on suggestions originally made by Mr. N. E. Goodchild, Senior Instructor in Agriculture. Three per cent. of gelatin was included in a single immersion alum-lead acetate treatment to ascertain whether an improvement in the waterproofing properties of the calico might be obtained.

Colloidal copper, as used for the spraying of tobacco seedlings, with the addition of Agral II. as a spreader was tested at a strength of 1 of stock solution to 8 of water.

The two controls differed in that one had the sizing removed by washing in hot water.

Discussion of Results.

The results obtained from these experiments are summarised in the accompanying table.

The Brisbane trial extended over six months while the covers at Mareeba and Bowen were exposed for approximately three months when they were returned and an examination made. For comparative purposes the table includes the mildew development for both three months and six months periods. In the former case as there were no essential variations in the relative amount of mildew developing in the respective treatments of each series the value given in the table represents an average estimate for the five localities. The results after six months refer to the Brisbane trial only. It will be observed that with some of the treatments a substantial increase in mildew development occurred over the second three months period.

The strength of the calico after treatment and exposure is a factor of considerable importance and determinations were obtained of this quality by submitting duplicate samples to the Government Analyst for testing on the Avery testing machine. The figures in the table represent the average of the composite strengths (the sum of the strength of the warp and the weft) expressed as pounds pressure to cause a fracture of the cloth, and serve to indicate the relative strengths following the six months exposure.

The waterproofing qualities were also determined after the lapse of the six months period and were evaluated by the methods adopted in the previous trials, the figures in the table representing the number of minutes taken for 90 c.c. of water to percolate through a standard depression made in the calico tied over the mouth of a jar.

TABLE 1.

RESULTS OF THE 1937-38 EXPERIMENTS FOR THE PREVENTION OF MILDEW IN TOBACCO SEED-BED COVERS

Treatment.	Mildew Development* (3 months).	Mildew Development (6 months).	Strength (lb. per sq. in.)	Water-proofing (Mins.)
Shirlan W.S. (1 per cent.)	–	+ to + +	57	3
Shirlan W.S. (0.25 per cent.)	+	+ + +	73	3
Shirlan AG. (1 per cent.)	+	+ + to + + +	87	3
Alum-lead acetate (standard schedule)	+	+	96	6
Alum-lead acetate (single immersion)	+	+	93	5
Alum-lead acetate (single immersion plus glue size 1 per cent.)	+	+	91	10
Alum-lead acetate (single immersion plus gelatin 3 per cent.)	+ to + +	+ to + +	95	210
Colloidal copper (1 stock to 8 water) plus Agral II.	–	–	66	3
Control (sizing removed)	+ + +	+ + + +	58	9
Control (untreated)	+ + +	+ + + +	66	3

*Symbols: – No developement of mildew. + Slight development of mildew. + + Moderate development of mildew. + + + Serious developement of mildew. + + + + Very serious development of mildew.

A review of the results obtained from these experiments shows that over an extended period the Shirlan treatments appear to be inferior to the alum-lead acetate treatments.

Colloidal copper, at the strength tested, gave excellent results as far as mildew prevention is concerned, no discoloration that could be attributed to mildew being observed. Compared with the alum-lead acetate treatments a loss in strength of the calico after exposure was noted, but the results indicate that further work might evolve a dilution retaining its fungicidal value but unaccompanied by this disadvantage.

The removal of the sizing from one of the controls produced no significant difference from the untreated.

The processes involving the use of alum with lead acetate on the whole were outstanding. There was no discernible difference in the mildew prevention between the standard schedule, the single immersion and the single immersion with glue size. As the single immersion process is simpler there is no reason why it should not be substituted for the method previously recommended. The addition of glue size in the amount used did not appear greatly to increase the waterproofing quality of the calico. On the other hand, the addition of 3 per cent. gelatin had a very marked effect in this respect and while this treatment is not quite so effective in preventing mildew it appears to have distinct possibilities for the waterproofing of calico. As the waterproofing quality is not considered essential for tobacco seed-bed covers the additional expense involved in the use of gelatin precludes its recommendation.

Following on their experiments in New Zealand Neill and Travers* show a decided preference for Shirlan W.S. over an alum-lead acetate treatment. With the latter treatment a loss of strength of the calico is also reported. The explanation of the greater efficiency of the Shirlan treatment may lie in the extension to one hour of the period of immersion, while it would appear that the increased concentration of the chemicals added, 12 per cent. as against a concentration of 3 per cent. used in Queensland, may have been the cause of the reduction in strength by the alum-lead acetate. These authors speak favourably of an iron-

*Neill, J. C. and E. Travers: Prevention of Deterioration of Tent Calico. New Zealand Journ. Sci. & Tech., XIX., 10, 646-51, 1938.

chromium method which gave complete protection from mildew, but apart from its prohibitive cost, the darkening of the treated calico renders it unsuitable for tobacco seed-bed covers.

As a result of this additional work it has not been possible to indicate a treatment superior to the two previously recommended. Of these the alum-lead acetate appears to be the better. Furthermore, as the two solutions involved in the standard schedule may be satisfactorily combined the method of treatment is thus simplified. The amended recommendation for carrying out the alum-lead acetate process is as follows: Dissolve 2 lb. alum and 1 lb. lead acetate each in 1 gallon of boiling water, then add these solutions to 8 gallons of cold water, making a volume of 10 gallons. The calico to be treated is immersed in the solution and worked well with the hands until it is thoroughly wetted, and then allowed to stand for 24 hours, after which it is removed and hung out to dry.

It is advisable to note that as all lead compounds are poisonous caution should be exercised in the use of water collected from calico treated by the alum-lead acetate process.

BINDWEED—A SERIOUS WEED PEST.

One of the most serious weed pests so far introduced into Queensland is the European Bindweed. This plant first made its appearance on the Darling Downs about ten years ago, or perhaps earlier, and little trouble has been experienced, in a general way, until the present season; but, judging by the number of specimens sent in to the Department of Agriculture and Stock, it has become very widely spread.

Farmers seeing small plots of it in their areas are advised to use every means of getting rid of it, for once it attains serious proportions eradication becomes almost impossible.

It may be described as a slender twiner with long creeping white underground stems, any part of which when broken off may form a new plant. The leaf is about an inch long, the flowers are white or pink—mostly white in the Queensland specimens—bell or broadly funnel-shaped and ½ to 1 inch across.

Any method for eradication must be designed to destroy the underground parts. This is best done by starvation, and if the top green growth can be kept down by cultivation or by sprays, the underground parts will eventually become exhausted.

Pigs are fond of bindweed, and have been found useful in keeping the weed in check, both in Australia and abroad.

It is a much more serious pest at the present time in the Southern States than in Queensland, but unless small plots are destroyed as soon as they appear, the plant will multiply rapidly.

—*C. T. White.*

Queensland Weeds.

SHRUBBY OR UPRIGHT MIST FLOWER

(*Eupatorium adenophorum*).

By C. T. WHITE, Government Botanist.

DESCRIPTION.—Weed of shrubby growth, usually 4-6 feet high, with numerous upright branching stems. In sheltered situations it is sometimes of more straggling nature. Stems rough to the touch due to a clothing of bristles. Leaves 2-3 inches long, 1-2 inches broad, broadest near the base; leaf-stalk slender, ¾-1 inch long. Flowers white, the individual flowers very small and borne in small dense heads, the heads arranged in terminal sprays or corymbs, 1-3 inches across; the whole effect is highly ornamental. Seeds (achenes) slender, angular, about 1 line long, blackish in colour, except at the apex and very base, surmounted by several fine white hairs (pappus); the hairs themselves very finely barbellate or plumose.

Distribution.—A native of Southern Mexico and Costa Rica, now established as a weed in New South Wales and South-east Queensland. It grows mostly along watercourses and in rather wet places.

Botanical Name.—Eupatorium commemorates Eupator, King of Pontus, who is said to have used a plant of this genus in medicine; adenophorum, from two Greek words, *aden*, a gland, and *phoreo*, I bear, in allusion to the rough gland-like hairs on the stems and to a lesser extent on the leaves.

Properties.—It is not known to possess any poisonous or harmful properties. It was probably introduced into Australia as a garden plant, as several species of Eupatorium are cultivated abroad as florists' flowers. A variegated form is said to be grown in Europe and North America.

Eradication.—So far as I have observed, personally, the plant is confined to creek banks and wet situations generally. From its nature I do not think it likely to become as aggressive a weed as the allied species, *Eupatrium riparium.* In most cases I think it can, where necessary, be dealt with by grubbing out.

Botanical Reference.—*Eupatorium adenophorum* Spreng. Syst. iii., p. 420. This species was originally recorded under the name *Eupatorium glandulosum* H. B. and K. (non Michx) as naturalised about Sydney by W. F. Blakely, in 1920. These names are synonymous. I have recently been in correspondence about the plant with the authorities of the Royal Botanic Gardens, Kew (England), and as they employ the former name it is recorded under it here.

Plate 1.
Shrubby or Upright Mist Flower, *Eupatorium adenophorum*.

Butter Standardisation.

L. A. BURGESS, A.A.C.I., Dairy Technologist.

THE purpose of butter standardisation is to manufacture an article with approximately the same composition throughout the year. Large fluctuations in composition affect palatability and may cause buyers to refrain from the regular purchase of a particular brand of butter. This may be fairly successfully avoided by control of both water and salt percentages to within certain ranges which also ensures that butter of an economical composition is manufactured.

A misconception of butter standardisation appears to exist in some quarters, a common idea being that it involves adulteration and is therefore inimical to the interests of the consumers. Such is not the case, as in reality it protects the consumer by ensuring that butter complies with the standards prescribed by law, and further, that there is little variation in palatability. From the dairy farmers' point of view, it ensures that he receives full value for his cream, because standardisation is only possible in an efficient factory.

Team work is essential for successful standardisation, as the buttermaker will be unable to standardise his methods unless he is supplied with correctly neutralised cream of the desired fat percentage and can obtain the conditions he requires for efficient churning. The main responsibility, however, must rest upon the buttermaker, as incorrect methods can be adopted even under the best conditions.

Moisture Tests.

The first essential to standardisation is accurate moisture testing. No buttermaker can even approach any desired composition unless he can rely upon the tests performed at the factory. An accuracy to within 0·2 per cent. is necessary, and is attainable provided reasonable care is exercised. The moisture balance is the most important in the factory, but it sometimes receives the least attention. Managers should provide the most suitable balance, irrespective of price, and see that complete facilities for accurate moisture tests are provided. If this is done, the entire responsibility is placed on the buttermaker and his assistants, but, if an unsuitable balance or poor facilities are provided, the manager must be held responsible. The following table, representing nearly 8,000 samples tested at the Hamilton Cold Stores during the six months July-December, 1937, shows how those factories performing accurate moisture tests are obtaining higher average moisture percentages than those where less care is exercised.

Average Error of Factory Moisture Tests.	Number of Factories.	Factory Tests Accurate to ±0·2 per cent.	Moisture in Butter (Average of Official Tests.)
		Per cent.	Per cent.
Up to 0·10 per cent.	15	73	15·32
0·11 per cent. to 0·20 per cent. ..	12	62	15·09
Over 0·20 per cent.	11	42	14·98

In the fifteen factories where the average error was no higher than 0·10 per cent. the average moisture was 15·32 per cent., and nearly three-quarters of the factory tests were accurately performed. In distinct contrast are the figures for the eleven factories where the average error was greater than 0·20 per cent., the average moisture being less than 15 per cent., and less than half of the factory tests were accurate. One of these factories had an average error of 0·50 per cent., an average moisture of only 14·79 per cent., and only 43 out of 230 tests (19 per cent.) were accurate to ± 0·2 per cent. Such tests are useless and might just as well not be performed. If moisture tests are worth performing at all, they should be done accurately.

Salting.

The salting of butter has a big influence on its palatability, and to some extent affects the keeping quality. Consumers naturally dislike being supplied with a lightly salted butter one day, and a highly salted butter the next. Evenness of salting is only obtainable by standardised methods which have been proved satisfactory. Only regular analyses of butter will show whether the salt percentage is being evenly maintained. The keeping quality of butter is controlled to a certain extent by the concentration of the brine incorporated in it. Salt is used more as a flavouring substance than as a preservative, but, when present in sufficient concentration, it has a depressing influence on bacteria which are unable to multiply to any great extent. The salt present in butter is dissolved only in the water. As bacterial growth also occurs in the water it follows that if there is sufficient salt present in each droplet of water to suppress the growth of undesirable bacteria, the keeping quality of the butter will be improved. The required salt concentration is obtainable when the butter contains not less than 1·3 per cent. of salt. The range of salt recommended is from 1·3 to 1·7 per cent., as not only will this prevent excessive bacterial growth, but the palatability will be quite satisfactory, and butter of an economical composition can be manufactured without infringing the legal standards. The table given below shows how the keeping quality is affected by the salt percentage. The figures represent 849 samples tested at the Dairy Research Laboratory under the Butter Standardisation Service being conducted for factories which have no laboratories of their own.

SALT PERCENTAGE AND ITS EFFECT ON THE KEEPING QUALITY OF BUTTER.

Percentage of Salt in Butter.	Number of Samples.	Keeping Quality (Bottle Test).	
		Good and Fair.	Poor and Bad.
Less than 1·3 per cent. ..	347	163 (47 per cent.)	184 (53 per cent.)
1·3 per cent. and higher ..	502	397 (79 per cent.)	105 (21 per cent.)

Unsalted Butter.

The keeping quality of unsalted butter depends entirely upon attention to cleanliness during its manufacture. Only the best cream can be used and the greatest care must be taken to prevent contamination at any stage. Considering the extra attention which must be given

manufacture and the lesser quantity of butter which can be manufactured owing to its higher fat content, a premium of at least 3 per cent. should be required by a factory contemplating its manufacture. The reasons for this are that while 100 lb. of salted butter can be made containing 82 lb. of fat, only about 97½ to 98 lb. of unsalted butter can be made containing the same weight of fat—a direct loss of 2 per cent. to 2½ per cent. in the butter production. Add to this the cost of the extra attention to grading and manufacture and it is understandable that a premium of 3 per cent. would provide no more than cover. The only constituent of unsalted butter which can be standardised is the water, while in salted butter standardisation of other constituents ensures the maximum quantity of butter being manufactured.

Laboratory Control.

Partial standardisation may be performed in the factory by the intelligent use of moisture and salt tests provided they are accurately performed, but complete standardisation is only possible with laboratory supervision. In Queensland there are two associations which have laboratories of their own, and the efficiency obtained is well exemplified in the average moisture in butter from the factories concerned. One association attained an average moisture of 15·5 per cent. for all of its factories, the lowest factory average being 15·42 per cent., and the accuracy of the factory moisture tests was very high indeed. The other association did not attain quite such a high standard, the average moisture from all of its factories being 15·3 per cent., only one factory, however, having an average lower than 15·24 per cent., and the accuracy of the factory moisture tests was reasonable. The percentage of salt was also successfully standardised, and the two associations have reason to be satisfied.

There is only one place where standardisation of butter should be performed, and that is in the butter factory. Inefficient factories which manufacture butter with low percentages of water or salt, or both, are depriving their suppliers of the money which blenders and large distributors obtain by incorporating additional water and salt before selling the butter to the consumers. Standardisation in the factory means that the consumer receives the butter in the condition in which it leaves the factory, and the full value of the butter is thus returned to the dairy farmer.

SCUMMY CREAM.

It frequently happens that when cream is being put through the strainer into the vat at a factory, a quantity of thick greasy substance is retained by the strainer. In most cases, this is due to the inclusion of the thick scum from the interior of the separator bowl with the cream. This is a practice which cannot be condemned too severely, and results frequently in the cream being graded down.

The Determination of Water in Butter.

L. A. BURGESS, A.A.C.I., Dairy Technologist.

THE method used for the determination of water in butter—commonly known as the moisture test—may be summarised as follows:—

> A known weight of butter in a weighed metal dish is heated until all water is expelled as steam. The dish and its contents are then cooled to atmospheric temperature and again weighed. The loss in weight is the water in the particular weight of butter taken and the percentage may be calculated by simple proportion.

There are quite a number of modifications in technique mainly due to various types of balances, but the principles of the test remain the same.

The equipment required is—

1. Balance and necessary weights.
2. Metal cup.
3. Spatulas to transfer butter to the cup.
4. Heater.
5. Tongs for handling the hot cup.
6. Cooling bath.
7. A number of clean dry cloths.

Facilities and Precautions.

A balance sensitive to at least 0·01 ($\frac{1}{100}$) gram is necessary for accurate moisture tests. It is an instrument of precision and should be treated as such. It must not be placed in a position exposed to air currents as accurate tests would be impossible under those conditions. Splashing water, steam, heat radiations and poor lighting are other factors which must be guarded against.

The bench or shelf on which the balance stands must be level and absolutely rigid so that vibrations from machinery, &c., do not interfere with the balance. So important are accurate moisture tests that a small laboratory or test room should be built as an integral part of every butter factory in which real efficiency is desired. This room, which, for chemical tests, need be only about 8 ft. by 6 ft., must be quite distinct from the room in which the fat tests are performed and close to the churning room. The size suggested offers ample bench space for moisture, salt and acidity tests which the butter-maker may desire to perform from time to time. A plan of such a laboratory is shown in Figure 1. Even in a room such as this, the balance should be protected from dust and chance currents of air by a case, preferably with a sliding glass door at the front.

The type of heater used in most factories is a spirit lamp. This certainly serves the purpose, but it has the great disadvantage that the bottom of the cup becomes covered with a deposit of carbon and the weight of the cup is thereby altered. As most factories generate electricity, the spirit lamps in such cases should be replaced by a suitable electric heater which is clean and equally rapid. Suitable types

SMALL LABORATORY FOR A BUTTER FACTORY.

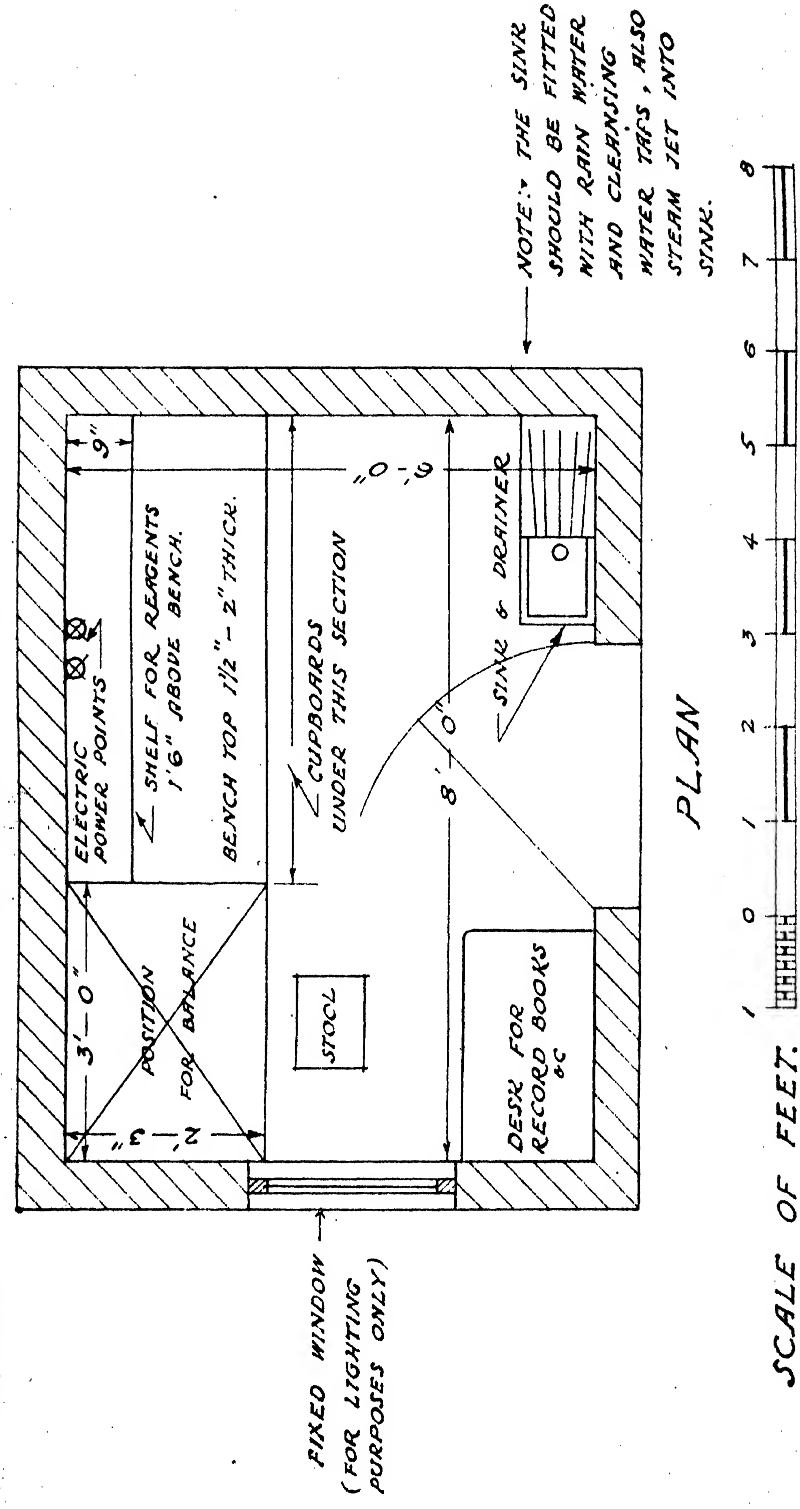

Plate 2.

are shown in Plate 3. The adapted electric radiator (A) has a heating element of about 500 watts and the hot plate (B) is of the three-heat type. Spare heating elements should be kept on hand for emergencies and only require to be screwed into place. Whatever type of heater is used, it should be placed *outside* the balance case and at least 1 ft. away.

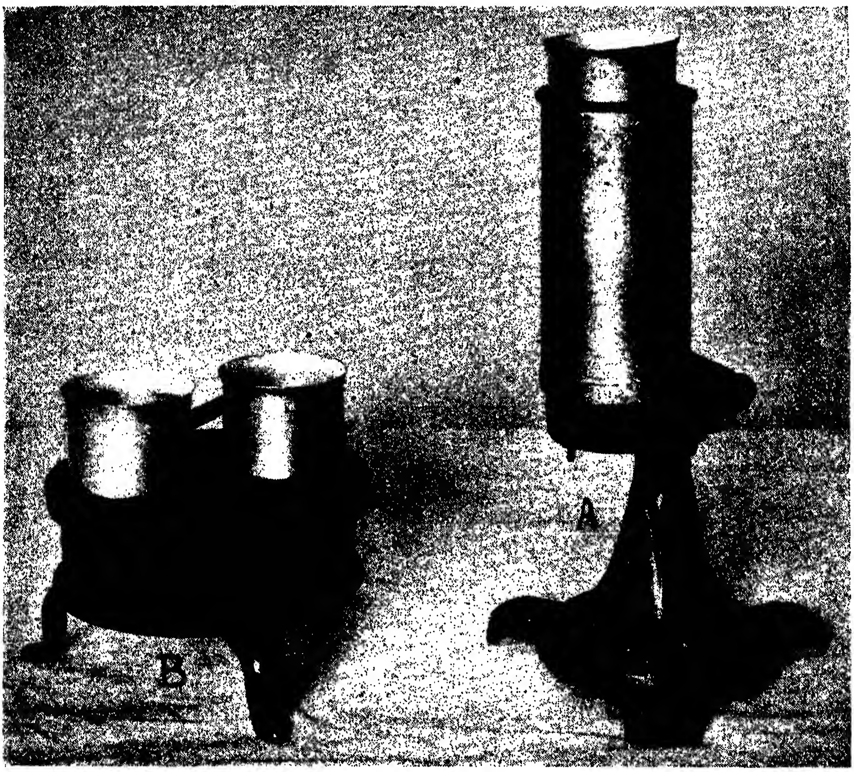

Plate 3.

ELECTRIC HEATERS.—A. Adapted electric radiator. B. Three heat hot plate.

Another important piece of equipment is a cooling bath in which the hot dish may be rapidly cooled to atmospheric temperature. A dish of cold water is very satisfactory for this purpose. A supply of clean, dry cloths must be available, as the dish must be wiped perfectly dry before being placed on the balance. *The dish must never be placed on the balance whilst hot,* as the heat transferred to one side of the balance immediately puts the balance out of adjustment and an inaccurate weighing or reading results, which may be perpetuated in following tests. The practice of making "hot weighings" is probably the principal reason of inaccurate factory tests.

Weights should never be handled with the fingers, but always with a small pair of forceps. The balance should always be brought to rest before adding weights or altering their position, as rough treatment will quickly wear away the sharp knife edges of the balance and destroy its sensitivity.

The remainder of the equipment requires little discussion. The metal cup is usually of aluminium, which is quite suitable for the purpose. Spatulas for the addition of butter to the dish should be of bone or some non-scratching material. One spatula should be ground to a fine point to facilitate the final adjustment. Tongs for handling the hot cup may be either the ordinary hand type or the spring type.

Taking the Sample.

In all chemical work the most important part of the process is the taking of the sample. One of the first axioms of the analyst is *"An analysis is only as accurate as the sample,"* and a sample must therefore be as representative of the whole as is possible. The butter from one end of the churn has not necessarily the same composition as butter from the centre or the other end, and *at least three portions of butter from various positions in the churn must be taken* to obtain a representative sample. In taking these portions the exposed surface of the butter with its adhering free moisture, must be removed before the portion is taken by using a spatula or trier.

Having obtained a representative sample this must be mixed thoroughly so that the analysis may be carried out in duplicate, if required, with the same result. There are several ways of preparing the sample, the main methods being—

(*a*) Place the butter in a dry glass jar with a tight-fitting lid, and place the jar in warm water at a temperature of about 100 degrees Fahr. until it is thoroughly softened, and may be mixed, by shaking, into a homogeneous creamy mass. If this method is used care should be taken to see that no unmelted lumps of butter remain. It is equally important not to overheat the sample, as this causes a separation of the serum from the fat, and in this condition it is almost impossible to obtain a representative sample.

(*b* Place the portions of butter on a slab of glass, or a glazed tile, about 6 to 8 inches square, and quickly and thoroughly mix with a bone spatula. A wide-mouthed cup of china or metal will be equally serviceable, but a narrow-mouthed vessel should be avoided, as it is difficult to mix the sample in a vessel of this type.

For factory use the latter method (*b*) is recommended, as it is much quicker, and the very small amount of moisture lost by evaporation during the mixing is not sufficient to cause a noticeable error.

The weighing of the ten grams of butter should be carried out immediately after the sample is prepared. If it is not convenient to weigh immediately, the sample should be placed in a glass jar with a tight-fitting lid, and mixed just prior to weighing.

Correct Method of Weighing.

With all balances, except the Avery balance, the weighing should be performed by allowing the balance to swing freely and noting the number of divisions reached by the pointer on each side of the centre line of the scale. When the balance is in equilibrium the pointer swings the same number of divisions on either side. *Do not accept a weighing in which the pointer remains stationary,* as the beam or pointer may be stuck.

The various techniques to be followed when using the better known types of balance are as follows:—

The Physical Balance.

The physical balance is one which can be used for many other purposes than the determination of water in butter. It can be used for general analytical purposes where extreme accuracy is not required, because a good physical balance may be sensitive to 0·001 ($\frac{1}{1000}$) gram. The balance shown in Plate 4 is the cheapest type, and requires a set of weights down to 0·01 gram.

Two methods may be used with this type of balance—

1. (*a*) See that the pointer swings an equal number of scale divisions on either side of the centre line with the pans empty.

 (*b*) Weigh the clean dry cup as accurately as possible by placing the cup on the left pan and the weights on the right pan.

 (*c*) Add ten grams to the weights already on the right pan and record the total weight (A).

 (*d*) Place butter from the well mixed sample into the cup until the balance is again in equilibrium.

 (*e*) Place the cup over the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage, the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

 (*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

 (*g*) Wipe the outside of the dish perfectly dry and replace on the left pan of the balance.

 (*h*) Weigh again as accurately as possible and record the weight (B). Subtract the second weight (B) from the first weight (A). The difference is the weight of water in the ten grams of butter taken.

$$\text{Percentage of water} = (A-B) \times \frac{100}{10}$$
$$= (A-B) \times 10$$

Example—

1st weight (A)	=	38·54 grams
2nd weight (B)	=	37·02 grams
Difference (A—B)	=	1·52 gram
Percentage of water	=	1·52 x 10
	=	15·2 per cent.

2. **The second method eliminates the use of a number of weights, the determination being performed by the use of a 10 gram, 1 gram, and the eight fractional weights from 0·5 down to 0·01 gram. Prepare a counterpoise from a piece of lead, brass, or copper to weigh exactly**

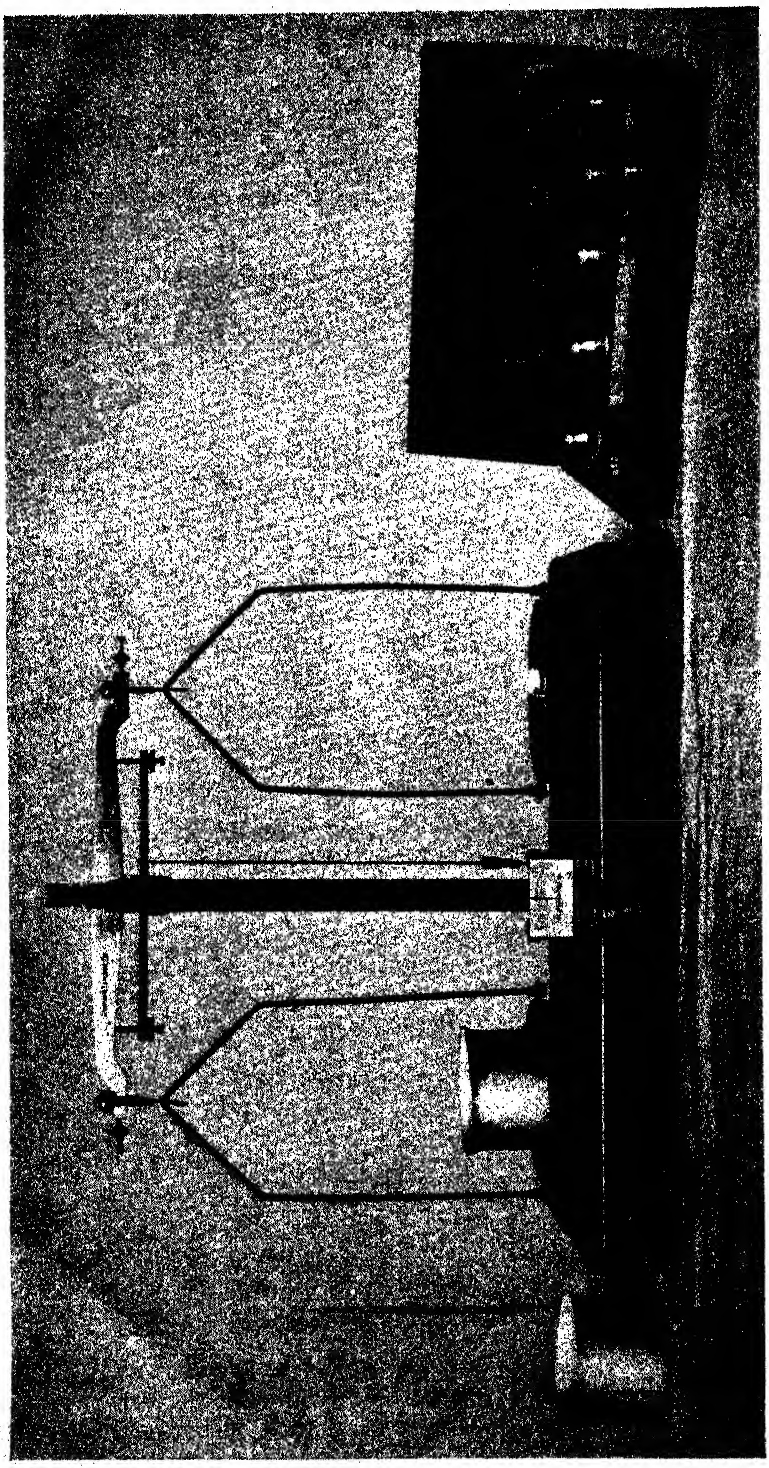

Plate 4.
The Physical Balance with set of weights and metal cups.

the same as the clean dry cup. If there are two or more cups available, a counterpoise for each may be made so that a number of tests may be performed at the same time. Then proceed as follows:—

(*a*) See that the pointer swings an even number of scale divisions on either side of the centre line with the pans empty.

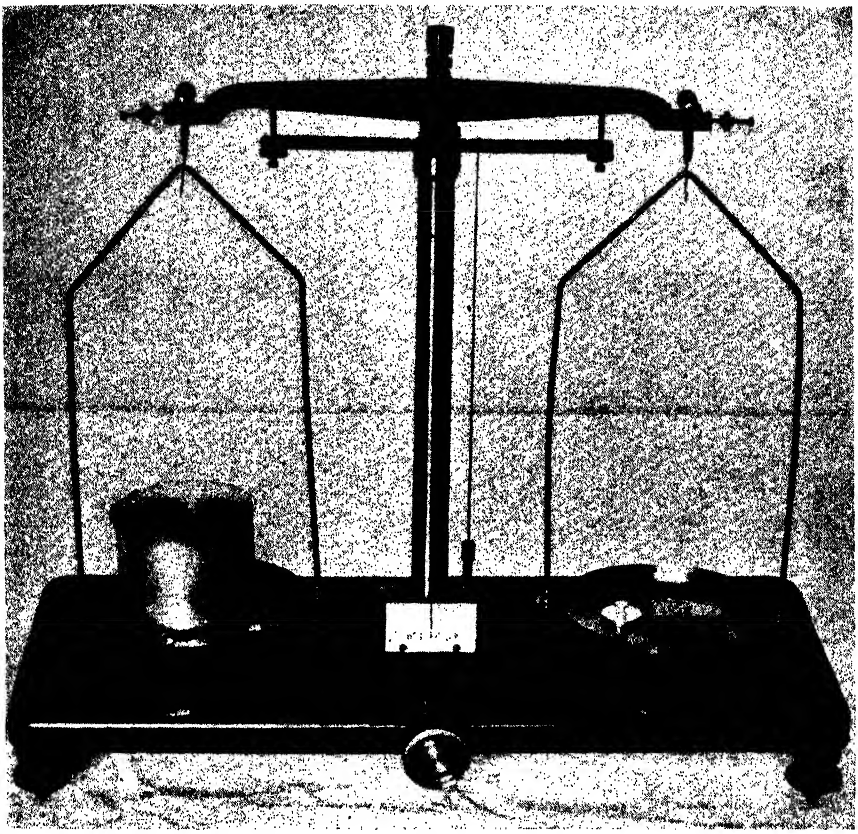

Plate 5.

The Physical Balance with cup, counterpoise and weights in position. The sum of the weights on the left pan is 1.57 grams, indicating 15.7 per cent. of water.

(*b*) Place the clean dry cup on the left pan and the corresponding counterpoise on the right pan and see that the balance swings evenly. If not, adjust the counterpoise to the correct weight.

(*c*) Place a 10 gram weight on the right pan with the counterpoise.

(*d*) Place butter from the well-mixed sample into the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides, and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the left pan of the balance.

(*h*) Leave the 10 gram weight on the right pan and add small weights to the *left* pan until the balance is again in equilibrium. The sum of the small weights added (C) is the weight of the water which was evaporated from the 10 grams of butter.

Plate 5 shows the balance with the cup, counterpoise, and weights in place.

$$\text{Percentage of water} = C \times \tfrac{100}{10}$$
$$= C \times 10$$

Example.—1·57 gram was added to the left pan.

$$\text{Percentage of water} = 1{\cdot}57 \times 10$$
$$= 15{\cdot}7 \text{ per cent.}$$

Physical Balance With Attached Rider.

A more satisfactory type of physical balance is that shown in Plates 6 and 7. A rider attached to the beam of this balance eliminates the use of weights smaller than 1 gram. This balance is adjusted with the rider on the O mark on the extreme left of the beam. The technique of the two methods given above requires a little modification when using this balance.

1. (*a*) See that the pointer swings an even number of scale divisions on either side of the centre line with the pans empty and the rider on the 0 mark of the beam.

(*b*) Weigh the clean dry cup by placing the cup on the left pan and weights down to 1 gram on the right pan until an extra 1 gram makes the weight too heavy. Then slide the rider along the beam until equilibrium is attained.

Example.—If the cup weighs 28·28 grams, 28 grams would be placed on the right pan (29 grams would be too heavy) and the rider slid along the beam to the 0·28 mark showing a total of 28·28 grams. (See Plate 6.)

(*c*) Leaving the rider in the same position, add 10 grams to the weights on the right pan and record the total weight (A).

Example.—28·28 + 10 = 38·28 (A).

(*d*) Place butter from the well mixed sample into the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the left pan of the balance.

(*h*) Weigh again as described in (*b*) above, and record the weight (B). Subtract the second weight (B) from the first weight (A). The difference is the weight of water in the 10 grams of butter and the percentage is obtained by multiplying the difference in weight by 10.

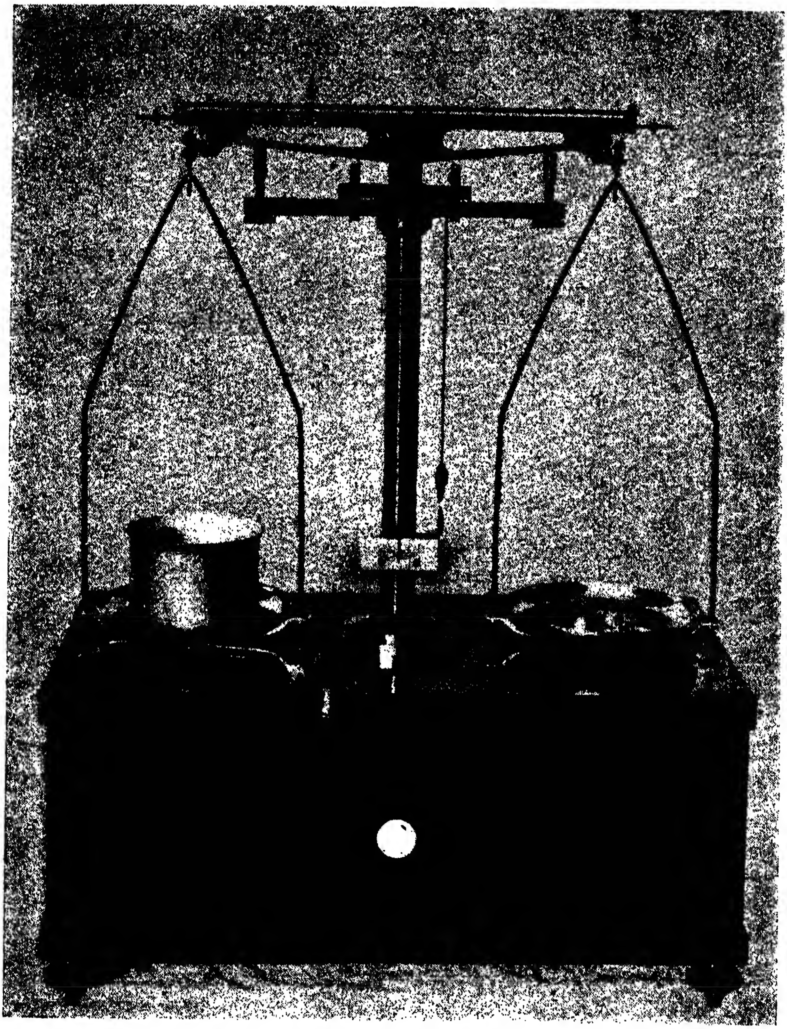

Plate 6.

The Physical Balance with attached rider showing a weight of 28.28 grams. Note that weights smaller than 1 gram are not required. The rider is indicated by an arrow.

Example.—

1st weight (A)	=	38·28 grams.
2nd weight (B)	=	36·72 grams.
Difference (A—B) ..	=	1·56 grams
Percentage of water ..	=	1·56 × 10.
	=	15·6 per cent.

2. Prepare a counterpoise for the cup as described previously.

(*a*) See that the pointer swings an even number of scale divisions on either side of the centre line with the pans empty and the rider on the 0 mark of the beam.

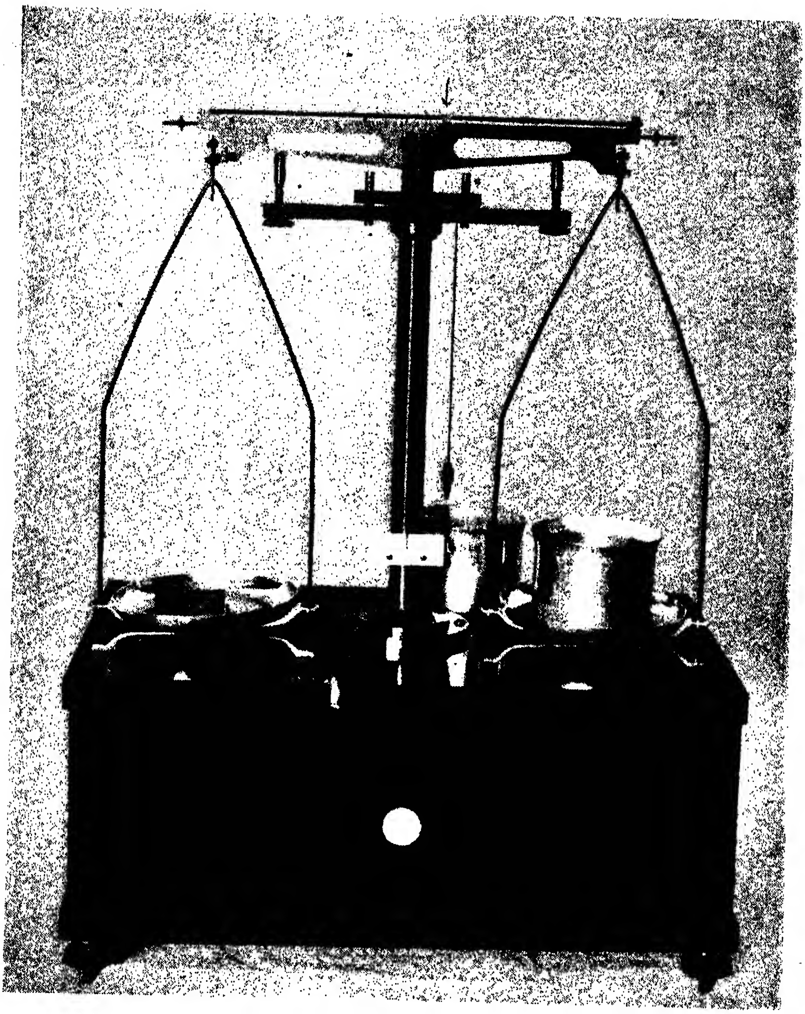

Plate 7.

PHYSICAL BALANCE WITH ATTACHED RIDER.—The cup, counterpoise, and 1-gram weight are in position, and the rider is on the 0.57-gram mark, indicating 15.7 per cent. of water.

(*b*) Place the clean dry cup on the *right* pan (note the change from the usual left pan) and the corresponding counterpoise on the left pan, and see that the balance is in equilibrium. If not adjust the counterpoise to the correct weight.

(*c*) Place a 10-gram weight on the left pan with the counterpoise.

(*d*) Place butter from the well mixed sample into the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides, and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the left pan of the balance.

(*h*) Leave the 10-gram weight on the left pan and place a 1-gram weight on the right pan and slide the rider along the beam until the balance is in equilibrium. The weight of water in 10 grams of the butter amounts to 1 gram plus the fraction of a gram shown by the rider. This sum is recorded as C.

Percentage of water = C x 10.

Example.—Plate 7 shows the balance with the cup and 1-gram weight on the right pan, the counterpoise and the 10-gram. weight on the left pan, and the rider on the 0·57 gram mark.

Weight of water in 10 grams of butter = 1 gram + 0·57 gram = 1·57 gram.
Percentage of water = 1·57 x 10.
= 15·7 per cent.

By following this technique the position of the rider will give what almost amounts to a direct pe centage reading—i.e., the rider on the 0·57-gram mark denotes 15·7 per cent., the 0·5 and 0·6-gram marks denote 15·0 and 16·0 per cent. respectively, and so on. For this reason, and because of its sensitivity and general utility, this type of balance is strongly recommended for use in a control laboratory or wherever reliable and accurate tests are required.

The Torsion Balance.

The Torsion balance, illustrated in Figs 7 and 8, is a robust, reliable balance specially designed for the determination of water in butter. With a set of weights it can also be used for other work where an accuracy of less than 0·01 gram is not required. The balance has four beams fitted with non-detachable riders. One beam is fitted with a large tare or counterpoise weight (A) with which the metal cup can be roughly counterpoised. Another graduated beam has attached to it a small tare weight (B) with which the final counterpoising of the cup is performed. Two beams, each having an attached rider, are graduated in percentages, the larger (D) being from 0 to 20 per cent. in 0·2 divisions and the smaller (C) being from 0 to 10 per cent. in 0·1 divisions. The balance is used as follows:—

(*a*) Place the percentage riders (C and D) on their respective zero marks (the left side of the rider coinciding with the 0 line at the left side of the scales), the small tare weight (B) on the zero mark in the centre of its scale and the large tare weight (A) as far to the right of its beam as it will go. Level the balance by adjusting the levelling screws so that the pointer swings an even number of scale divisions on either side of the centre line. Do not again touch the levelling screws.

(*b*) Place the cup on the right pan. Roughly counterpoise it by sliding the large tare weight (A) to the left and screwing it in place and then counterpoise it accurately by sliding the small tare weight (B) to the right or left as required. When a number of tests are being made a number of cups of approximately the same weight (within a range of 0·5 gram) are required, and the exact position of the small tare weight (B) for each cup should be noted.

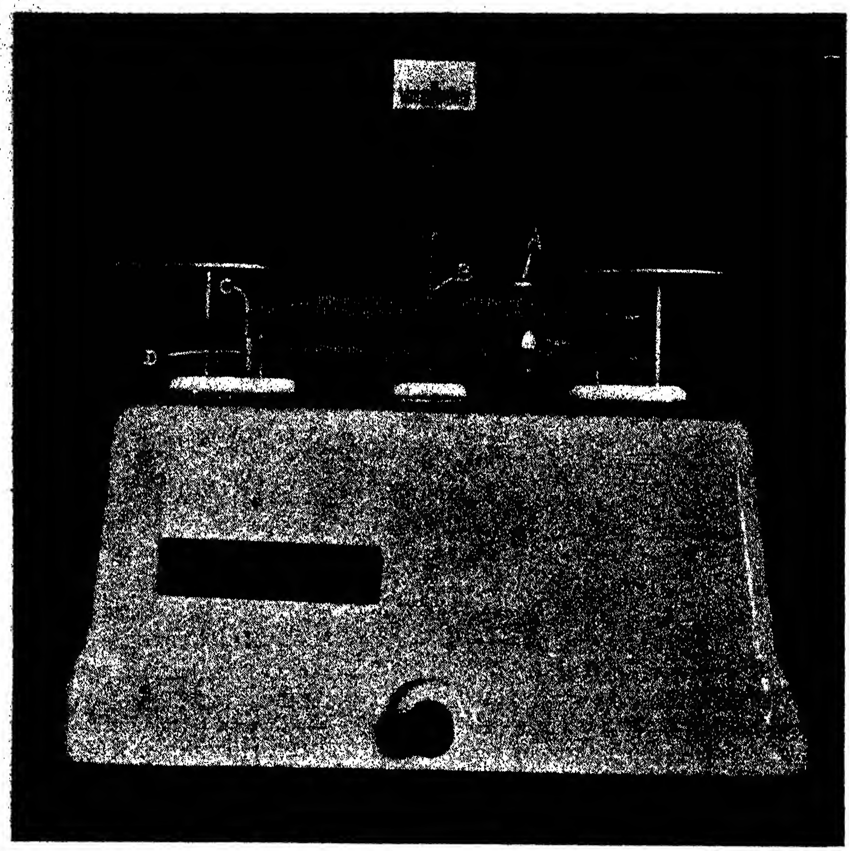

Plate 8.

THE TORSION BALANCE.—A. Large tare weight. B. Small tare weight. C. Smaller percentage rider on the 0 to 10 per cent. scale. D. Larger percentage rider on the 0 to 20 per cent. scale.

(*c*) Place the 10-gram weight on the left pan.

(*d*) Place butter from the well mixed sample into the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the right pan of the balance.

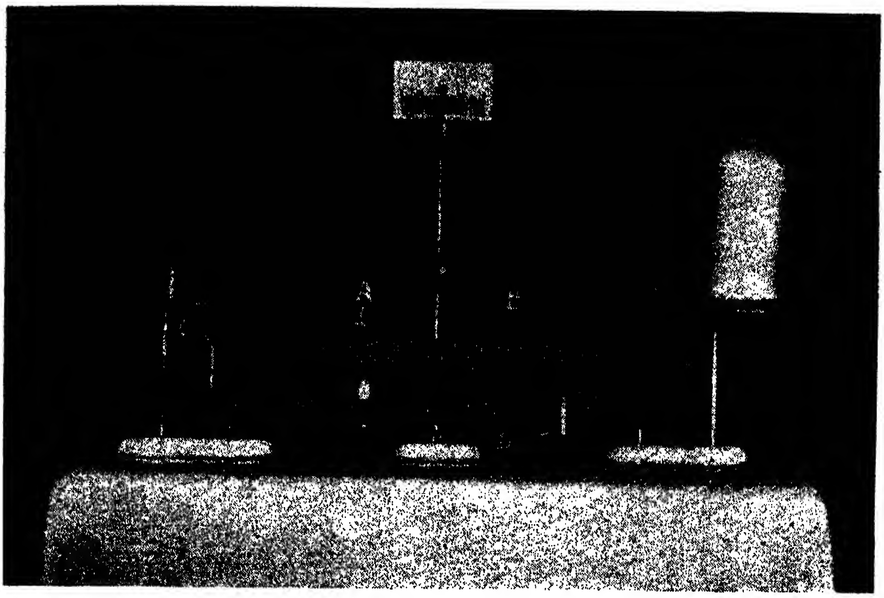

Plate 9.

BEAMS OF THE TORSION BALANCE.—Note the altered positions of the tare weights A and B. The larger percentage rider D indicates 15.6 per cent. of water.

(*h*) Leave the 10-gram weight on the left pan and slide the larger percentage rider (D) along its scale to the right until the balance is again in equilibrium. The percentage of water in the butter is obtained by taking the reading on the scale corresponding to the left-hand side of the rider. If desired, this rider may be slid along to the 10 per cent. or other mark and the smaller rider (C) used to obtain the final reading in which case the two readings must be added together. When a number of tests are made together, the small tare weight (B) must be replaced in the correct position for each cup as determined in (*b*) above.

Example.—Plate 9 shows a close up view of the scales showing a reading of 15·6 per cent. using the larger rider (D) only.

The One-pan Balance.

This type of balance is a one-purpose balance as it can only be used for the determination of water in butter. It also has a number of other disadvantages when compared with the physical and torsion balances, not least amongst them being the loose weights of a special design which can only be handled with the fingers, no forceps being provided with the balance. Another disadvantage is that only one test at a time can be performed unless a number of cups of *exactly* the same weight are available. Fairly reliable results are obtainable if the balance is kept

clean and the cup and weights handled only with clean dry hands. A typical balance of this type is illustrated in Plate 10. The weights supplied with the balance are a 10-gram hooked weight, a 2-gram rider, and a 0·2-gram rider. Working directions are as follows:—

(*a*) Place the clean dry cup on the pan.

(*b*) Suspend the 10-gram weight from the hook above the pan, allow the balance to swing and adjust, by means of the screw on the right of the beam, until the balance pointer swings the same number of scale divisions on either side of the centre line.

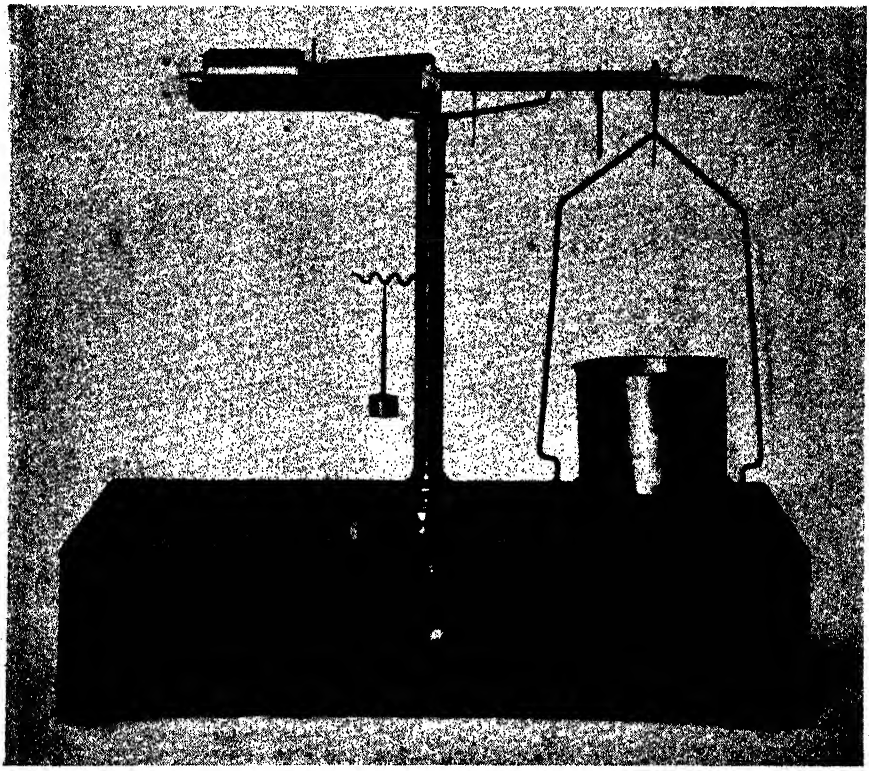

Plate 10.

THE ONE-PAN BALANCE.—The riders show 15.4 per cent.

(*c*) Remove the 10-gram weight.

(*d*) Place butter from the well mixed sample in the cup until the balance is again in equilibrium.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

Plate 11.

THE AVERY BALANCE.—A. Compensating weight. B. Lock nut. C. Adjusting screw (behind bar.) D. Sampler.

(*g*) Wipe the outside of the cup perfectly dry and replace on the balance pan.

(*h*) Place the 2-gram rider on one of the percentage marks on the graduated beam taking care that the rider is seated properly in the groove and does not touch the beam supports. If necessary, alter the position of the rider until the percentage mark lower than the true percentage is found. Then place the 0·2-gram rider on the beam in the various grooves until the balance is again in equilibrium. The percentage is obtained by noting the positions of the riders, the larger giving the whole per cent. and the smaller giving the tenths of 1 per cent.

Example.—In Plate 10 the larger rider (A) is on the 15 per cent. mark and the smaller rider (B) is on the 4 per cent mark. The butter would contain 15·4 per cent. of water.

The Avery Balance.

A comparatively recent introduction is the Avery oil damped balance in which the pointer is rapidly brought to a stationary position by means of a paddle immersed in an oil bath. It is a one-purpose balance capable of being used only for the determination of water in butter. A compensating weight enables any quantity of butter between 8 and 12 grams to be taken and the percentage of water is obtained direct from the scale. It has a serious disadvantage for butter standardisation purposes, as no salt test can be performed unless the exact weight of butter taken is known. To weigh out a definite quantity of butter on this balance requires a radical modification of technique as the balance is designed to make such a weighing unnecessary. If more than one test is to be performed, a number of cups of *exactly* the same weight are required. Constant skilled attention is required to obtain consistently accurate results. The balance is supplied with a 12-gram weight for adjustment purposes. The balance is used as follows:—

(*a*) Screw down the compensating weight (A) as far as it will go. Plate 11 shows the correct position. Do not shift the lock nut (B) under any circumstances.

(*b*) Place the clean dry cup and the 12-gram weight on the pan. The pointer should come to rest exactly on the 0 mark on the right of the scale. If not, adjust to the 0 mark by rotating the screw C (behind the bar) with a turn screw, clockwise or anti-clockwise as required.

(*c*) Remove the 12-gram weight.

(*d*) By means of the butter sampler (D) take a portion of the well mixed sample and place in the cup. Alter the position of the compensating weight (A) until the pointer again rests on the 0 mark.

(*e*) Place the cup on the heater and shake gently during the evaporation of the water to prevent spurting. During the final stage the butter froths up in the cup, then subsides and the fat may be seen boiling quietly. The colour will then be a light brown.

(*f*) Remove the cup from the heater and cool to atmospheric temperature in the cooling bath.

(*g*) Wipe the outside of the cup perfectly dry and replace on the balance pan.

(*h*) Read off the percentage of water from the scale.

Another article describing methods of determining the percentage of salt in butter will appear in a later issue of this Journal.

FOOD REQUIREMENTS IN A MAINTENANCE RATION.

All livestock rations are divisible into two parts—the part used for maintaining the body in a healthy condition, and the part used for production, whether it be for hair, wool, fat, meat, milk, or progeny. Under severe winter or drought conditions, the livestock owner is more concerned with a maintenance standard of feeding, and it becomes important to know where economies may most effectively be introduced.

A short consideration of an animal's reactions to starvation will supply the answer. Take the dairy cow in full lactation: the first defence which nature attempts is a conservation of material and the milk yield falls rapidly. Supplies to the body covering are restricted, and a dull, shaggy, lustreless coat develops. The body reserves of fat are called on and the animal becomes thinner. Horns and hooves become brittle. As starvation advances, some encroachment is made on the last defences—the muscles and vital organs. At this stage, the animal weakens rapidly and collapse followed by death results. It is, therefore, clear that the last defences of the body—i.e., the muscles and vital organs—must be protected. For this purpose, the animal must be supplied with protein. In other words, drought feeding should centre round protein rich foods. Where the stock are close to the source of such foods, the relative merits of each should determine which is to be fed, but on distant properties where freight charges are high it becomes important to buy the most concentrated and most digestible preparations.

Producers often remark that nature gave the sheep a commodious intestinal tract which must be filled, and they usually buy roughage of only moderate protein content. The argument is fallacious when the question is one of maintenance for limited periods only. It is surprising how well sheep can keep their condition on as little as 2 oz. of cotton seed meal and 4 oz. of maize daily.

The mineral requirements of stock should be provided for, but the excessive quantity of salt in many licks is unnecessary. Animals are capable of retaining enough salt for normal body functions from a very restricted intake, but lime and phosphate are continuously excreted and must be supplied in greater quantities. More than 30 per cent. of salt in a lick is rarely necessary, and in most cases it could well be less. Lime and phosphate are supplied in a number of forms, but on current prices well prepared sterilized bone meal containing about 20 per cent. protein is, apparently, the best.

Dusting Preparations for Pest* Destruction.

LABELLING AND EVALUATION.

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DUSTING preparations or mixtures for the destruction or control of agricultural or horticultural pests are sold in great variety in Queensland.

Owing to the complexity of the ingredients used in the manufacture of these materials, considerable difficulty has been experienced in the past in evolving a method of labelling that would be satisfactory to both the user and the officers of the Department of Agriculture responsible for controlling the quality of pest destroyers.

The principal ingredients used in these dusts are:—Arsenate of lead, copper carbonate, copper sulphate, derris powder, nicotine sulphate, nicotine, sulphur.

Less common ingredients are pyrethrum powder, creosote, and tobacco dust.

Certain "inert" materials are often included for two main reasons—to dilute the ingredient or ingredients used to the required strength, and to improve the dusting properties.

Stickers to improve the adhesive properties of the dust are also sometimes present.

The obvious method of labelling dusting preparations would be to declare the percentages of the respective pest-destroying ingredients used—such as: 30 per cent. arsenate of lead, 20 per cent. copper carbonate, 30 per cent. derris powder.

There are two serious flaws in this system, however. The first is that the ingredients used are not all of uniform composition, and the second is that it is an extremely difficult matter to estimate by chemical analysis the percentage of ingredient present.

All of these ingredients may be evaluated and analysed chemically, however, by reference to their "active constituents"—which in the case of inorganic preparations are either elements or their oxides (such as copper (Cu) or arsenic pentoxide (As_2O_5)) and in the case of organic preparations are compounds of known formula (such as nicotine $C_{10}H_{14}N_2$).

A brief description of the ingredients is as follows:—

Arsenate of Lead.

Commercial arsenate of lead cannot definitely be set down by chemical formulæ, but contains varying proportions of "chemical" acid lead arsenate $PbH(AsO_4)$ and/or "chemical" basic lead arsenate $Pb_5(OH)(AsO_4)_3$. Acid and basic commercial arsenates of lead are both recognised as pest destroyers. Impurities associated with the manufacture are present in the commercial article. Naturally, the ratio of arsenic pentoxide (As_2O_5) to lead oxide (PbO) varies in different samples. Arsenate of lead is standardised in Queensland on a minimum

* In the Queensland Pest Destroyers Act, the definition of pest destroyer includes any insecticide or fungicide.

arsenic pentoxide (As_2O_5) content of 30 per cent. As "basic" arsenate of lead contains less than 30 per cent. arsenic pentoxide, the material on the Queensland market is limited to the "acid" form. In a dust the only reasonable method of evaluation would be on an arsenic pentoxide basis with a proviso that the lead oxide be present in equivalent proportion.

Copper Carbonate.

This is easiest analysed and compared on a copper (Cu) basis, as it is not a chemically-pure copper carbonate, but an impure basic copper carbonate ($Cu(OH)_2CuCO_3$) containing, when manufactured from copper sulphate and carbonate of soda, traces of basic copper sulphate. It also contains other impurities, such as moisture. If chemically pure, the percentage of copper (Cu) would be just over 57; in actual practice a minimum of 50 per cent. is set as a standard.

Copper Sulphate.

This is usually in the "dehydrated" form when used in dusts, and consists chiefly of monohydric copper sulphate ($CuSO_4 \cdot H_2O$).

The actual percentage of copper (Cu) present depends on its preparation and its proper storage prior to mixing—as it readily reverts to crystalline copper sulphate ($CuSO_4 \cdot 5H_2O$) on exposure to the atmosphere. Owing to its variable composition, it should always be evaluated on a copper (Cu) content basis. The usual percentage present in fresh material is around 35.

Derris Powder.

This is a natural product obtained by grinding the roots of certain plants of Derris spp. The quality varies considerably, and although methods of evaluation on a basis of rotenone or "Tuba toxin" percentages may not be perfect, they are of far greater value than a declared percentage of derris powder. Much work is being carried out on this subject by research workers at the present time, and it seems possible that a collective evaluation of the active constituents may be made by measuring the optical rotation of a benzene extract of the material concerned. Preliminary experiments have shown that, with certain plants at least, toxicity to insects is proportionate to the optical rotation.

Nicotine Sulphate.

This is the usual source of nicotine in dusting mixtures, and is a mixture of nicotine sulphate and water—together with commercial impurities—standardised on a minimum of 40 per cent. nicotine ($C_{10}H_{14}N_2$) by weight. The declared percentage of "commercial nicotine sulphate" would be almost a valueless factor unless the nicotine content of such nicotine sulphate were known.

Nicotine.

Commercial nicotine (approximately 90 per cent. purity) is sometimes used in dusting mixtures. It is a liquid which takes in water from the air, requiring to be stored in airtight containers to avoid deterioration.

Sulphur.

The forms usually in dusting preparations are ground and sublimed (Flowers). These materials are as near to chemical purity as can be

expected commercially, but even so, the full 100 per cent. of commercial sulphur is not usually recovered as the element sulphur (S) on analysis. It is necessary to declare on the labels the percentage of sulphur (S) and the form of sulphur used (ground or sublimed). The percentage declared would naturally be based upon the chemical purity of the commercial sulphur used.

It will be seen from the above that owing to the complexity, variability, and impurity of the commercial ingredients used in dusting mixtures, it would be very difficult to ascertain by chemical analysis the actual weights of the original ingredients used; and even if these weights were ascertained the value of the dust would be still dependent upon the percentages of the active constituents present in these original ingredients.

Thus, although it is essential that the names of the ingredients be stated, it is obvious that a declaration on the label of a dusting mixture of the percentages of the ingredients would be very vague without the percentages of the active constituents also.

For instance, two mixtures could each include, say, 40 per cent. of copper sulphate, but if the copper (Cu) content of the copper sulphates used analysed 30 per cent. and 35 per cent. respectively, it will be seen that one mixture would contain 12 per cent. copper (Cu) and the other 14 per cent. copper (Cu).

The difficulty in supplying the necessary information is overcome by declaring on the label the percentages of the active constituents and the names only of the ingredients in which such active constituents occur. The method is similar to that used in the labelling of fertilizers. For example—

"3·0 per cent. Nitrogen as Sulphate of Ammonia."

If the percentages of the original ingredients are also declared on the label, they should be located on some part of the label well away from the percentages of the active constituents and names of the ingredients—so as to avoid confusion.

The following sets out the general method of expressing the active constituents of the materials above mentioned:—

..................per cent. Copper (Cu) as dehydrated copper sulphate.
..................per cent. Copper (Cu) as copper carbonate.
..................per cent. Arsenic pentoxide (As_2O_5) as arsenate of lead.
..................per cent. Nicotine ($C_{10}H_{14}N_2$) as nicotine sulphate.
..................per cent. Sulphur (S) as ground sulphur.

The "per cent." refers to the active constituent and the word "as" may be taken as meaning "present in the form of."

To illustrate the practical application to a complete dusting mixture, let us consider the labelling of a mixture made from, say—

20 per cent. arsenate of lead
5 per cent. nicotine sulphate
20 per cent. copper carbonate
55 per cent. hydrated lime.

Now, taking the arsenate of lead as containing a minimum of 30 per cent. arsenic pentoxide (As_2O_5), the nicotine sulphate as containing a minimum of 40 per cent. nicotine ($C_{10}H_{14}N_2$), and the copper carbonate as containing a minimum of 50 per cent. copper (Cu), the label should read as follows:—

6 per cent. Arsenic Pentoxide (As_2O_5) as Arsenate of Lead.
2 per cent. Nicotine ($C_{10}H_{14}N_2$) as Nicotine Sulphate.
10 per cent. Copper (Cu) as Copper Carbonate.

The hydrated lime is not added for pest-destroying purposes but as a "carrier to improve the physical condition," and need not be declared.

All pest-destroyer labels should, of course, bear the net contents, full directions for use, and the name and address of the Queensland wholesale (primary) dealer as well as the particulars set out above.

Summary.

The ingredients used in dusting mixtures for pest-destroying purposes cannot readily be represented by definite chemical formulæ and are not capable of accurate estimation by chemical analysis on a "100 per cent. return" basis when present in mixtures in conjunction with ingredients of the same type. Even if the percentages of the ingredients were ascertained, it would still be necessary to know the percentages of the active constituents they contained, before evaluation or comparison of the dusting mixture could be made.

Therefore, dusting mixtures should be labelled with the percentages of the active constituents present and the names only of the ingredients in which such active constituents occur.

If the percentages of the ingredients are shown they should be located on a portion of the label away from the active constituents so as to avoid confusion of the percentages concerned.

QUEENSLAND SHOW DATES.

July.

Cleveland	8th and 9th
Ayr	8th and 9th
Townsville	11th to 14th
Rosewood	15th and 16th
Esk	15th and 16th
Charters Towers—	
Show and Rodeo	19th to 21st
Laidley	20th and 21st
Maleny	21st and 22nd
Cairns	26th to 28th
Gatton	28th and 29th
Caboolture	29th and 30th

August.

Atherton	2nd and 3rd
Pine Rivers	5th and 6th
Home Hill	5th and 6th
Royal National, Brisbane	15th to 20th

September.

Imbil	2nd and 3rd
Ingham	2nd and 3rd
Pomona	9th and 10th
Tully	9th and 10th
Beenleigh	16th and 17th
Southport	24th

Banana Growing in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture and Chief Inspector, Banana Industry Protection Board.

(*Continued from page 643, June issue, 1938.*)

VARIETIES.

LITERATURE published by authorities on this subject claims that in some tropical countries up to sixty distinct varieties are grown. In Queensland, probably twenty types are recognised as different varieties, but commercially, fourteen of these may be discarded; and when it is considered that on the chief banana markets throughout the world Cavendish (and mutants of the Cavendish) and Gros Michel predominate, six marketable varieties here may be regarded as satisfactory. Following is a brief description of the principal varieties grown in Queensland:—

(Reference made to well-grown plants only.)

Cavendish—

Pseudostem: Height, 6 feet. Green, heavily splashed with brownish purple.

Leaves: Length, 5 feet; breadth, 16 to 24 inches. Deep green. Petioles short and sturdy; edges form deep and wide trough.

Bunch: Large, compact, irregular conical shape. Average, 10 to 15 dozen. Sheds fruit bracts sometimes.

Remarks: Extensively grown in Queensland. Represents, approximately, ten-elevenths of the total area under bananas, in the State. Its dwarf habits, hardiness, and indifference (within reason) to climatic changes make this variety a general favourite. Production approximates 120 cases (1½ bushels) per acre per annum.

Mons Marie—(A Cavendish mutant of 1908. Now recognised as a variety in Queensland.)

Pseudostem: Height, 10 feet to 16 feet. Green, heavily splashed with brown. Diameter, slightly less than well-grown Cavendish.

Leaves: Length, 7 feet; breadth, 24 inches. Green. Petioles short and sturdy, similar to Cavendish.

Bunch: Typically long and cylindrical, well-spaced fruit, distinct upward curve. Average, 15 dozen, individuals up to 23 dozen. Sheds the fruit bracts readily as compared with Cavendish.

Remarks: Resembles Cavendish in bunch habits. Fruit is of very even grade, superior to Cavendish in size and possesses better carrying capacity. This variety requires abundant shelter, deep cultivation and a generous and even rainfall. The popularity of this variety is increasing each year and, in suitable districts, its culture is recommended in preference to the Cavendish. Production approximates 200 cases (1½ bushels) per acre per annum.

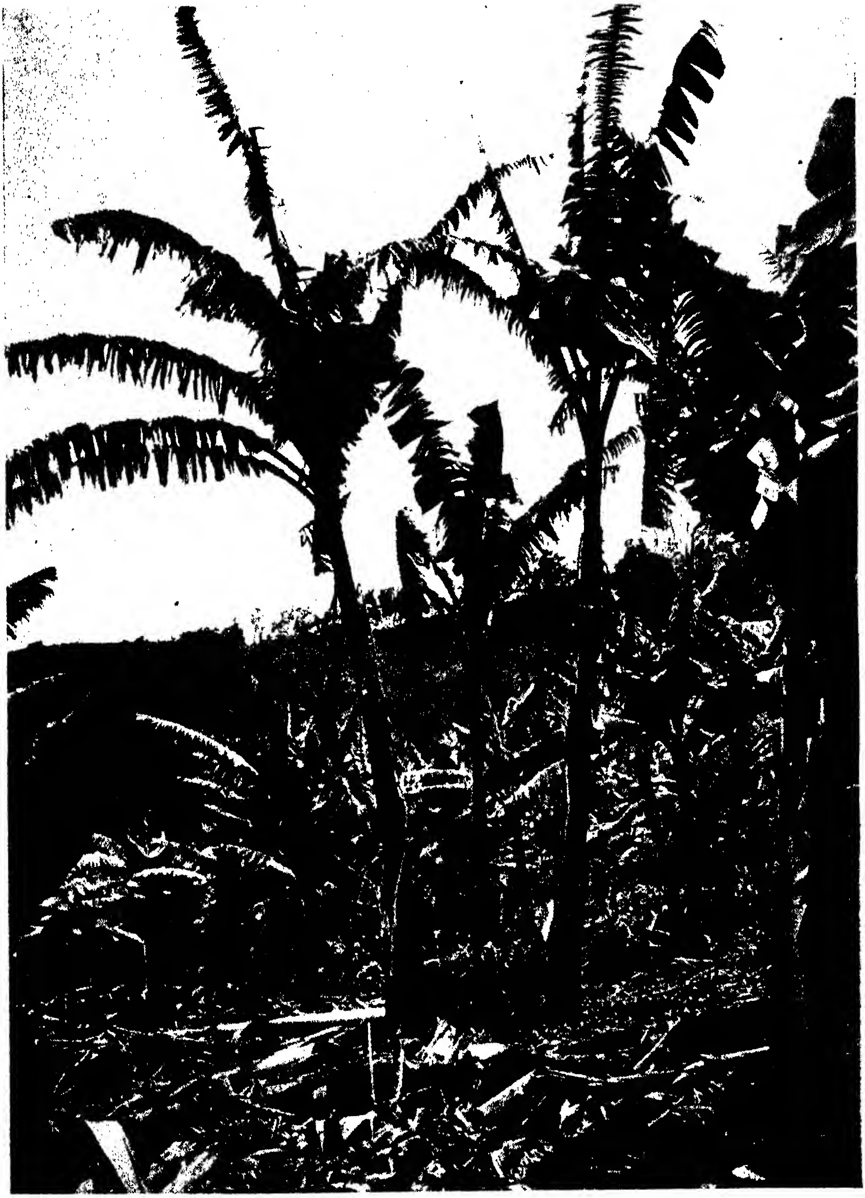


Plate 12.
Embul-Hondarawala bananas at Currumbin, South Coast.

Veimama—(Mutant of Cavendish recorded in Fiji, 1912, and now recorded in Fiji as a variety.)

A few hundred plants were imported from Fiji in 1934. Later distribution of these plants was made and, to date, this variety is looked upon very favourably.

Both pseudostem and bunch resemble Mons Marie, while the leaves are more drooped and the petiole a little longer.

Plate 13.
Fruit of the Embul-Hondarawala.

Gros Michel—

Pseudostem: Height, 16 to 18 feet. Clear green, with dark purple patches.

Leaves: Length, 9 feet. Green, rising upwards and outwards in graceful curves. Petioles 16 to 18 inches, green, pink flush on underside, edges pinkish brown. One side of leaf blade attached to petiole much lower than other. Petiole forms deep trough with edges spread outwards.

Plate 14.
Fruit of the Ducassis Hybrid (showing similarity to that of the Blue Java).

Bunch: Large, long cylindrical. Well-spaced fruit curved upwards, finger tips pointed. Average about 15 dozen.

Remarks: An excellent variety when conditions are most suitable. Essentially suited to well sheltered tropical areas. Prone to suffer serious damage from high winds. Excellent fruit to handle and probably the best carrying commercial banana grown. Queensland districts producing this variety are situated from Townsville north. Production approximates 200 cases (1½ bushels) per acre per annum.

Plate 15.
'Lady Finger'' bananas grown at Pinkenba, near Brisbane.

Lady Finger—

Pseudostem: Height, 14 to 18 feet. Stout and sturdy. Bright green, splashed with dark purple and brown patches.

Leaves: Length, 8 feet. Width 25 to 27 inches. Bright green. Petioles very stout, light green, edges form deep, narrow trough. Usually carried more upright than other varieties.

Bunch: Stands well out. Sheds bracts rapidly. 6 to 10 dozen Fruit short, thick and somewhat angular. Flavour piquant and slightly acid. Ripens well.

Remarks: A very robust variety not so subject to damage from pests and diseases as the other commercial varieties. It is highly probable that there are two types grown under this name in Queensland. Plants are often seen with leaves forming a greater angle with the pseudostem and with fruits carrying a light bloom. This variety is grown for and marketed as a bunch product on local markets. The plant's resistance to low sub-tropical temperatures allows for its productiveness on alluvial land within reasonable transport distance of city or country centres. Production approximates 2,000 dozen per acre per annum.

Sugar—

Pseudostem: Height, 10 feet. Rather slender. Green tinged with light pink, especially in the younger plants.

Leaves: Length, 6 to 7 feet. Width, 24 inches. Green. Carried in very graceful curves on long slender petioles. Edges of petioles just meet. Midrib very faintly tinged with pink on underside.

Bunch: 6 to 8 dozen. Fruit short, thin skinned. Ripens well to pale yellow. High sugar content.

Remarks: A very popular variety for a local market bunch trade, and an excellent dessert fruit. Unfortunately, this variety is very susceptible to disease and this has restricted its extension to a considerable degree.

These six varieties comprise the recognised commercial bananas of Queensland.

Other varieties grown in this State include Colombo, Red Dacca, Green Dacco (or Raja), Lubin (or Bookabooka), Common Plantain, Andalusian, Blue Java, Ducassis Hybrid and Embul-Hondarawala, all of which find favour in some localities.

Of these, the Embul Hondarawala is outstanding, attaining a height similar to the Lady Finger and producing a bunch somewhat similar to the Gros Michel and almost as large. Its slender pseudostem renders it very liable to wind damage, hence its slow acreage increase.

While the Blue Java is little known in Queensland, there are those who claim it to be an appreciable dessert fruit. In growth, it is similar to the Ducassis Hybrid and both fruits carry a heavy bloom and ripen with the same colour.

The Lubin (or Bookabooka) is probably the best cooking variety grown. Of tall growing habit, this hardy variety produces a bunch averaging 5 to 6 dozen very large fruits. When ripe, the fruit is very

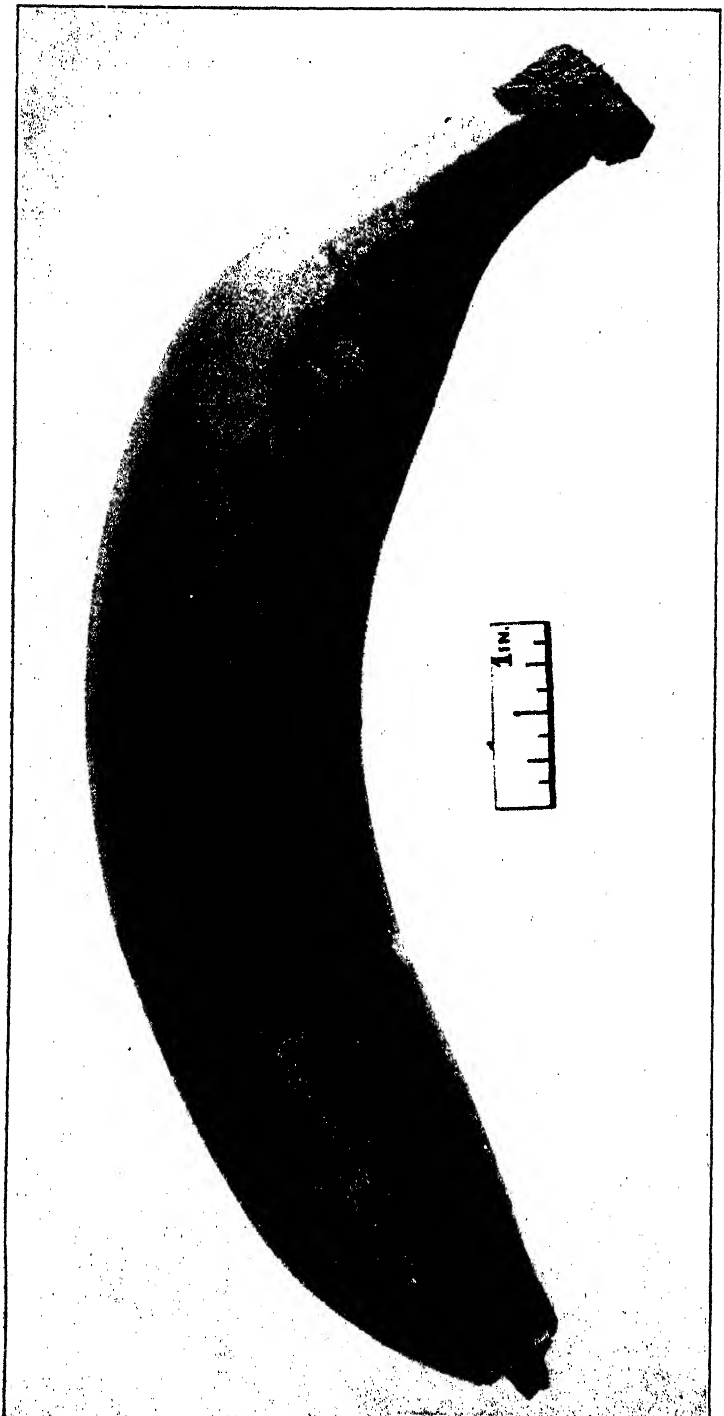


Plate 16.
The Cavendish Banana.

thin skinned and the flesh slightly pink in colour. Its quality as a cooking banana is known throughout the islands of the Pacific.

Of the others, little need be said apart from a distinct variety point of view.

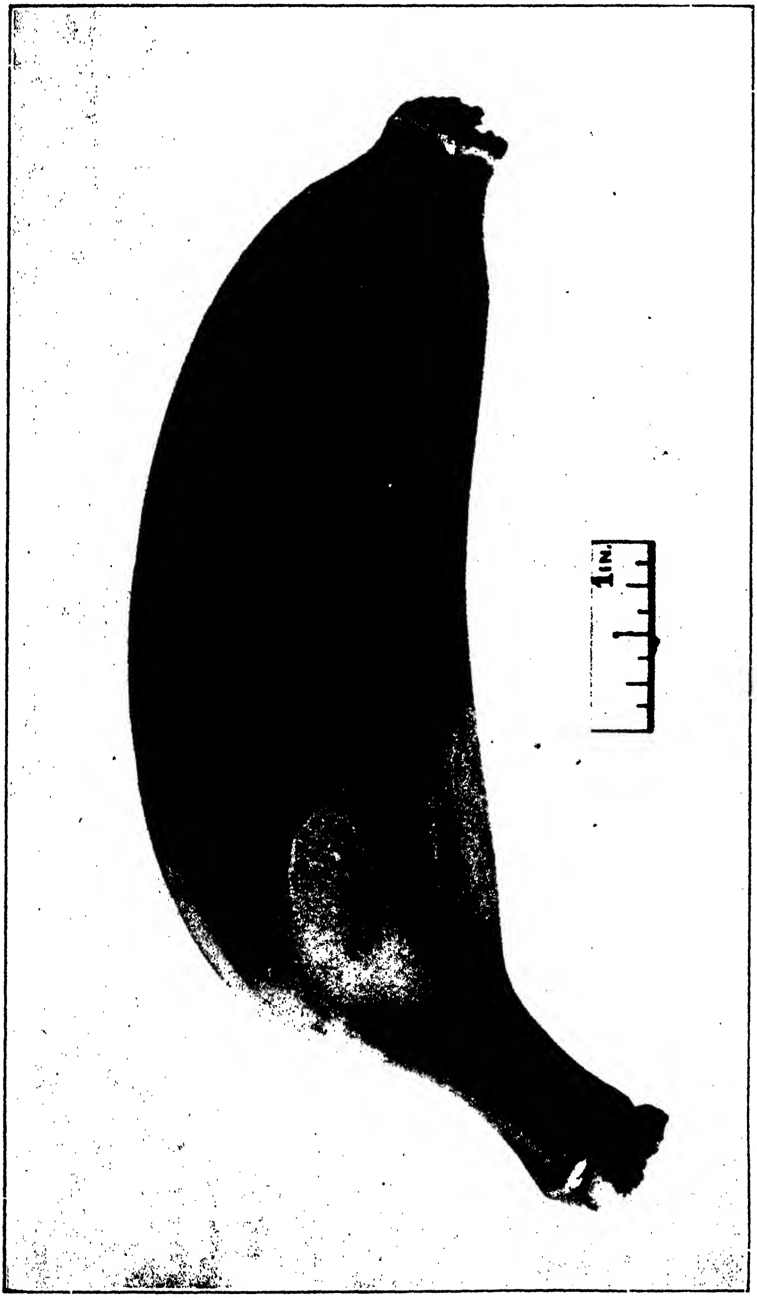


Plate 17.
The "Lady Finger" Banana.

PESTS AND DISEASES OF THE BANANA.

The chief pests of the banana in Queensland are the Weevil Borer and the Banana Thrips, and the most important diseases are Bunchy Top and Leaf Spot. Advice and guidance on these matters from departmental field officers are available to growers. Banana pests and diseases are further controlled by the restriction of planting to healthy material.

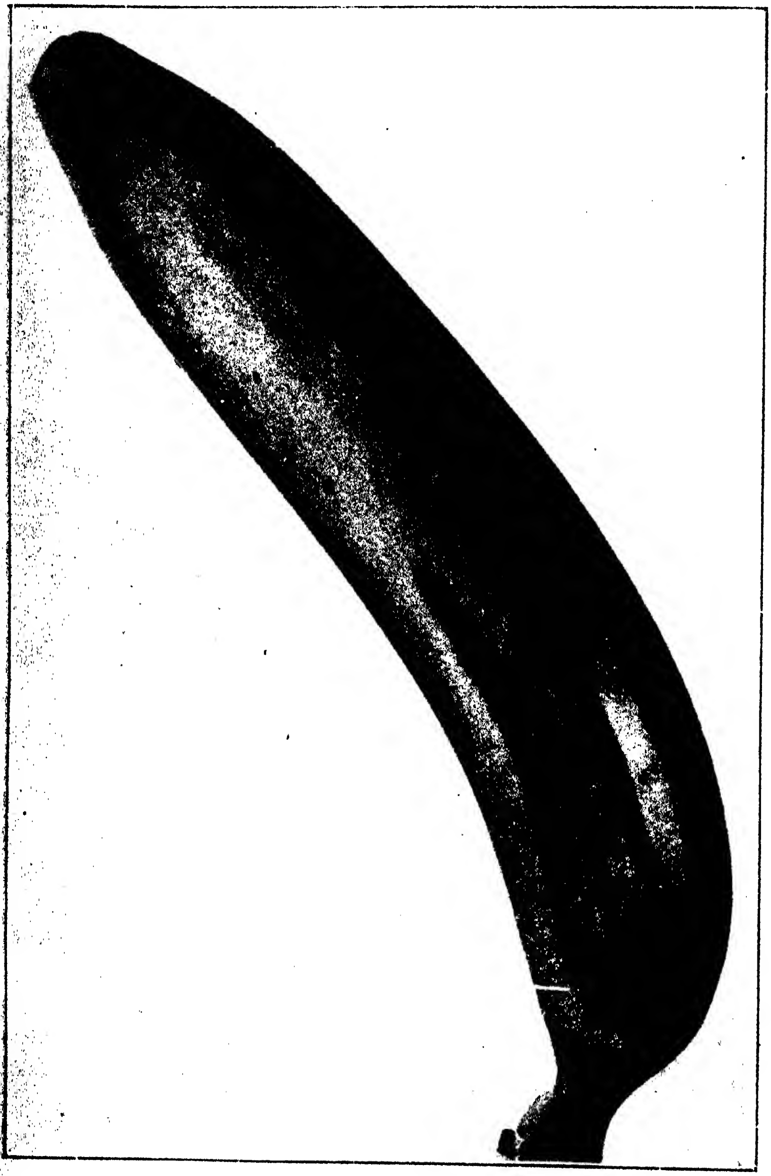


Plate 18.
The Gros Michel Banana.

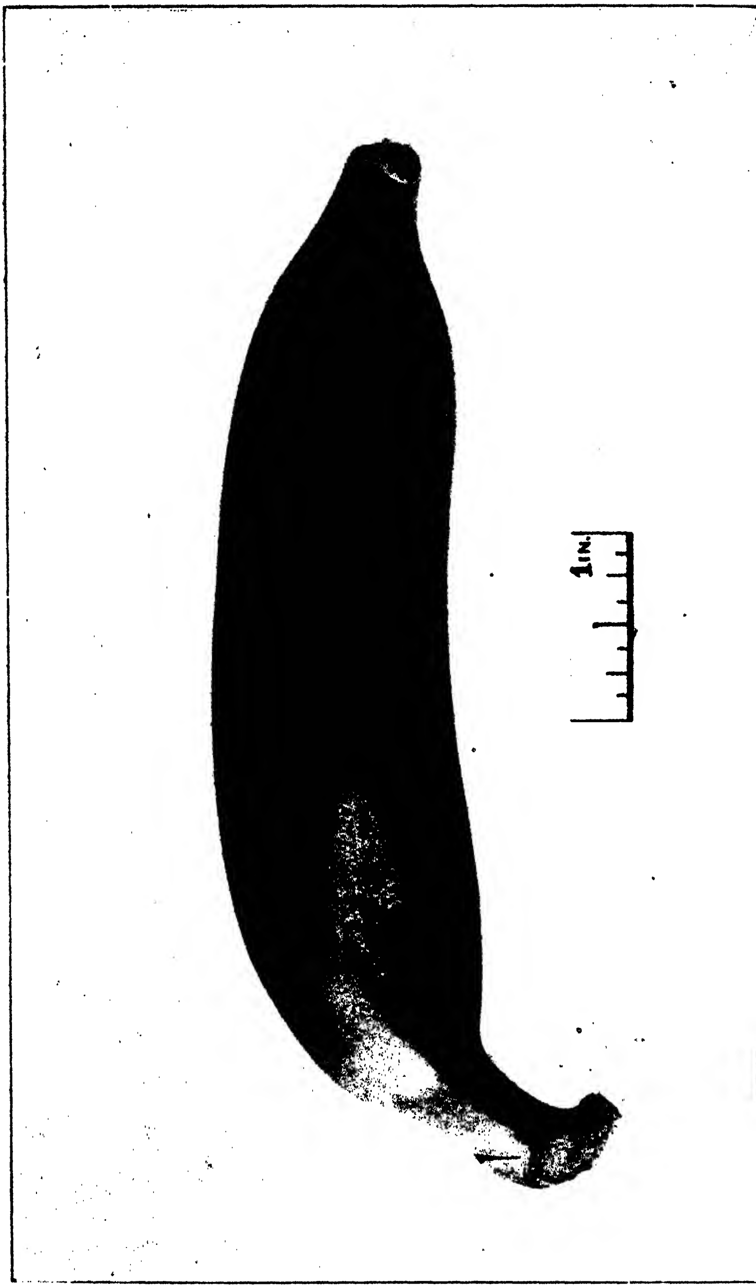


Plate 19.
The Sugar Banana.

Departmental literature on all matters appertaining to banana growing in Queensland also may be obtained free of charge on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

[CONCLUDED.]

Crop Rotation, with Special Reference to the Principles of Green Manuring.*

A. F. BELL.

IT is proposed in this lecture to discuss in general terms the subject of crop rotation, paying particular attention to the scientific principles involved in that form of crop rotation which is known colloquially as "green manuring."

It is an axiom of agricultural science that continuous cropping to the one crop is likely to be one of the worst possible practices of husbandry. And particularly is this to be condemned when the crop in question is one which requires constant and intensive cultivation as is the case with maize and sugar-cane. When opening the conference in Cairns last year the Minister for Agriculture drew attention to certain undesirable trends in the direction of soil erosion and impoverishment and made a plea for balanced agriculture.

At the conference held in Bundaberg in 1935 I submitted a paper entitled "Sick Soils," and at this stage we will review briefly some of the points presented in that paper:

It is a significant fact that the permanent agricultural systems of the old world, with their centuries of experience, are all built upon well-planned programmes of crop rotation. Such programmes usually involve about a five-year cycle, any particular crop appearing not more than twice in the cycle, while the succession is planned so that a particular crop plant is not followed by one of similar habit, type, diseases, and method of cultivation. Thus in a planned rotation corn would not follow sugar-cane and *vice versa.*

What then, one may now ask, are the unhappy results which may follow continuous cropping to a crop plant which requires constant and intensive cultivation. The answer is that under such conditions as prevail in these dry, unirrigated areas the soil will suffer a gradual but remorseless loss of fertility while at the same time it develops a chronic "sickness."

During the 40-year period from 1898 to 1937 the average yields of sugar-cane in tons per acre in the Bundaberg-Gin Gin district have been as follows:—

1898-1907	1908-1917	1918-1927	1928-1937
14·6	15·3	14·4	15·9

During this period much new land has been brought under cultivation, the use of artificial fertilizers has developed from nothing to a highly important farm practice, while new and better varieties have been grown. Yet the yield of cane has barely held its own, and one might well ask why it has not progressed.

In an exhaustive analysis of rainfall data made by Mr. Norman King and published in the "Canegrowers' Quarterly Bulletin" for October, 1936, we find that (many opinions to the contrary) the seasons

* Address to the Queensland Society of Sugar Cane Technologists, Bundaberg Conference, 25th February, 1938.

have not changed; the average annual rainfall has been maintained. Obviously, then, the explanation of this static position must lie in a gradual loss of the inherent fertility of the soil, which is balanced by improved varieties and otherwise improved farm practice.

Now it has so happened, through the fortunate foresight of one of the old pioneers of the Woongarra, that there was left standing a patch of the original virgin scrub. Some few years ago we carried out comparative tests on this virgin soil and a field immediately adjacent which had been cultivated for twenty-two years. Of course, a great deal of this land has now been cultivated for over fifty years, and a comparison with this would without doubt be even more depressing, but it is bad enough as it is. Figures observed from some of the tests were as follows:—

	Virgin Soil.	Adjacent 22 years cultivated.
Moisture Equivalent*	38%	30%
Organic Matter (or Humus)	7·8%	3·6%
Nitrogen	0·48%	0·22%

In short, the native fertility is being rapidly lost as a result of growing continuously a crop which is a gross feeder and which requires that constant cultivation which brings about fertility depletion and soil erosion; the soil is becoming "dead."

We pass now to another side of the picture—the development of a "sick" condition of soil. The normal fertile soil literally teems with countless numbers of minute, invisible plants known as bacteria and fungi; they are so small that 15,000 or 20,000 bacteria laid out end to end would only stretch about an inch. These lowly microscopic plants include both benefactors and enemies of the plants we cultivate. The great majority, fortunately, have a beneficial effect or at least do no harm; they are concerned in the decay and rotting of vegetation, making the enclosed plant-foods available to the growing crop, assisting in the weathering of the soil, converting nitrogen to forms suitable for the plant, and so on. Generally speaking, the more fertile the soil the greater will be the numbers of these beneficial and harmless little organisms.

It is possible to count these organisms with reasonable accuracy by means of a very simple process: A small amount of the particular soil under investigation is taken and gently shaken with a measured quantity of water so that the bacteria and fungi become evenly distributed through the water. A known fraction of the watery suspension is then drawn off and mixed with a substance known as nutrient agar. This agar is poured into a glass plate, where it solidifies like gelatine and, in the course of a few days, the bacteria and fungi multiply, and each forms a colony which later becomes visible to the naked eye. We are then able to count the numbers poured into the plate, and so, by multiplication, the numbers in the amount of soil taken. Such numbers

* This soil contains a high proportion of so-called "hygroscopic" moisture which is not available to the plant; therefore about 20 per cent. should be subtracted in each case, giving *effective* moisture-holding capacities of 18 and 10 per cent.—a decline of nearly 50 per cent. Small wonder then that cane on these soils now commences to show distress a fortnight after good rain. Similarly the humus, nitrogen, and other plant foods have declined to low levels.

are usually given as the numbers per gram of soil—an amount equal to about a quarter of a teaspoonful of soil.

We made counts of this type on two soils which were separated by only a headland, but, while one farmer has allowed his soil to run down and become dead, the other has consistently practised trash conservation and green manuring for many years, and so has largely maintained the fertility of the soil. The counts were—

Organisms per gram of soil.

	Bacteria.	Fungi.	Total.
Fertile Soil	16,800,000	2,200,000	19,000,000
Worn-out Soil	3,100,000	50,000	3,150,000

But in addition to these beneficial and harmless bacteria and fungi the soil contains parasites which attack the roots of the plant, and the less beneficial or harmless organisms there are the better chance the parasites have. Now, soil which is virgin soil in so far as a particular type of crop is concerned will contain few, if any, parasites which will attack it. However, as successive plantings of a particular crop are made, so do the parasites which will attack it increase in numbers, and ultimately are present in sufficient numbers to distress the plant and stunt its growth. Many root parasites will attack a large number of closely related plants, and the planting of corn, for example, in "sick" cane land will only serve to further increase those parasites which attack members of the grass family generally. On the other hand, during the period of continuous planting to sugar-cane, the parasites which might attack, say, a legume are left without a host, and so they diminish greatly in numbers and may even become extinct.

This, then, is a basic point in the planning of rotational programmes. No one plant is left in the ground long enough for its particular parasites to build up in great numbers; it is displaced by a second crop plant, and the numbers have diminished before the first crop is returned to the soil again.

That a condition of soil sickness has been brought about in at least some of our older cane lands will be readily appreciated by reference to Plate 20. In this case cane was grown in "sick" soil and in soil which had been "cured," so to speak, by sterilizing. As can be seen, the sick condition of the soil has caused a very marked loss of vigour as a result of root rot.

The agricultural phase of the Queensland cane-sugar industry is based upon the practice of continuous cropping to this one crop, a crop which, moreover, requires extensive cultivation and which has little protective influence on the soil. We say continuous cropping because a possible green-manure crop every four years cannot be regarded as crop rotation. The time has come when the trends resulting from this unfortunate combination of circumstances must be recognised and faced, even though farmers do not control two important factors which have largely determined the adoption of this practice. These are (*a*) the almost complete absence of payable alternate crops and (*b*) the existing system of cane land assignment, whereby a farmer must restrict cane production to a certain certified area, precludes the adoption of a rotational programme if a farmer is growing up to his full assignment.


1. 2. 3. 4.

Plate 20.

Reading left to right—(1) Sterilized soil, (2) Sterilized soil, (3) 75 per cent. Sterilized soil, 25 per cent. unsterilized soil, (4) Unsterilized soil. Variety—Q. 813. Note failure of cane to stool in 3 and 4.

It does not appear probable that there will be developed in the near future any extensive production of alternate crops which can be marketed as such, although there does seem to be some scope for the utilization of land for intensive grazing and fodder production. In this connection we might make passing reference to the very successful experiment in lucerne production at the Bundaberg Station and the interesting fat lamb raising experiment which is being carried out at the Mackay Station.

There is, however, another aspect of crop rotation which warrants your consideration and attention, and that is rotation to crops which may not in themselves be directly payable propositions, but which will help to restore the fertility of the land to such a level that the same amount of cane may be grown more profitably on a reduced area of land. We have in progress at the Bundaberg Station a long-range experiment which will test the economics of this proposition over a number of years within the limitations of the assignment system. In this experiment part of the field will be cropped according to usual practice, that is, we will take off a plant and two ratoon crops, the second ratoon crop being harvested at the end of the season, ploughed out, and prepared for planting in the following autumn. In the other portion of the field a plant and one ratoon crop only will be taken off, and the field will then be planted to a succession of leguminous crops for a period of sixteen months. We are now carrying out trials to find additional legumes which will be suitable for this type of rotation, including types which may be either ploughed in or grazed if the occasion warrants.

The reason for the advocacy of legumes as a rotational crop is twofold. Firstly, they are very widely removed from sugar-cane in so far as plant relationships are concerned, and it therefore follows that

parasites of legumes are most unlikely to attack sugar-cane and *vice versa*; therefore a prolonged period of cropping to legumes will see a vast reduction in the ranks of the army of sugar-cane parasites. Secondly, a legume possesses the peculiar power of obtaining its nitrogen requirements from the nitrogen of the air instead of drawing them from the soil, as do other plants. Consequently, when a leguminous crop is ploughed into the soil, the soil may be enriched in nitrogen to an amount equivalent to a substantial dressing of sulphate of ammonia, but for which no account will be rendered at the end of the month. The explanation of the manner in which this free nitrogen supply is obtained will constitute the second part of the talk.

It has long been recognised by farmers that the growth of leguminous crops tends to enrich the soil. Later it was found that this was due to the fact that in some way or another these plants could actually add to the store of nitrogen in the soil. Consequently legumes came to be more and more used as rotational crops, particularly when soils showed a tendency to become run down, or immediately preceding the growth of a crop which needed large amounts of nitrogen for its proper growth. Trial and experience showed that it often happened that a particular legume would not grow when planted in fields which had never grown legumes or had not been planted to them for a long time. In other cases a variety which did well in one part of the world was for some unexplainable reason practically a complete failure when taken to another country with a similar climate. Observant farmers had, however, discovered the fact that they could often improve yields in a new field by "inoculating" it with a few loads of soil taken from a field in which the particular crop grew well; doubtless many of you have seen this practised by old lucerne growers.

Investigation of these phenomena by trained agriculturists has removed the veil of mystery, and we are now able to present a pretty clear picture of why and how legumes assist in the regeneration of soil, why there are fluctuations in growth, and why there may be almost complete failures.

Leguminous crops planted in a soil rich in nitrates and other plant-foods will grow vigorously in the same way as do other crops. It so happens, however, that, unlike other crops, they would also grow vigorously, and possibly even more satisfactorily, if the same soil were very deficient in nitrates. The reason for this somewhat contradictory performance lies in the fact that leguminous plants, in association with a certain type of bacterium, can draw their supplies of nitrogen from the atmosphere instead of being forced to take it in the form of soil nitrates as is the case with other plants.

As you know, some four-fifths of the atmosphere in which we live is composed of nitrogen, and, of course, this atmosphere diffuses into the soil, so that in a well-aerated soil there is always atmospheric nitrogen in contact with plant roots. This atmospheric nitrogen, however, exists in the form of an inert gas, and in that form it cannot be absorbed and utilised by man, animals, or crop plants. It may, however, be "fixed" and converted into forms suitable for such use, and in various overseas countries there are vast works for capturing this nitrogen and converting it into the sulphate of ammonia which you

apply to the soil, and which is converted into nitrates in the soil. As suggested above, it may also be captured and converted into suitable forms by legumes working in association with bacteria.

Upon digging up a legume and washing the roots free of soil, it will be noticed that in most cases there are small galls or nodules attached to the roots. These nodules represent the tiny workshops within which the fixation and conversion of the nitrogen of the air is carried out by bacteria of the genus *Rhizobium*. The relationship is a mutual benefit society, since the plant supplies the bacteria with free board and lodging, while the bacteria, on the other hand, help the plant to free supplies of nitrogen. This nitrogen is not stored in the nodules, as many people seem to think, but is immediately distributed over the rest of the plant for use in making new growth.

In Plate 21 are reproduced the root systems of two soybean plants, and attached to the main roots of these will be seen a cluster of these galls or nodules. Countless numbers of bacteria exist within the nodule; they are small, rod-like creatures about $\frac{1}{10000}-\frac{1}{15000}$ inch long (*see* Plate 22). These bacteria may readily be grown or cultured in the laboratory in tubes of agar or gelatine, where they form a yellowish-white glistening, slightly raised growth. In this condition they cannot use atmospheric nitrogen, and we have to feed them artificial forms of nitrogenous food.

In the normal course of events these *Rhizobium* bacteria live in the soil, obtaining their plant-foods, including nitrogen, from the soil. When the seed of a legume germinates in their vicinity these minute bacteria attach themselves to the very fine hairs on the young rootlets and work their way into the roots. Here they commence to multiply greatly in numbers, stimulate the plant to produce the galls or nodules, and the work of nitrogen fixation proceeds. After the crop has been harvested or ploughed in the nodules break up and decay and the bacteria are distributed into the soil again, where they can continue to live for considerable periods (sometimes years) and await the growing of another suitable legume.

It will readily be seen that if the land has never grown legumes before, or over a long period, there may be none of this type of bacterium left in the soil; in such a case, of course, there will be no nodules formed, no atmospheric nitrogen fixed, and the plant will have to depend on the nitrogen supplies of the soil. Even when the necessary bacteria are present, if there should be a high reserve of nitrates present in the soil, this will depress or prevent the activities of the bacteria, and there will be little or no gall formation and nitrogen fixation; in such a case the ploughing in of the green manure crop would merely result in returning to the soil the nitrogen which had been taken out by the crop, and would not increase the nitrogen stocks one little bit. Obviously, then, the time for the planting of a green-manure crop (as distinct from a mere cover crop) is when the nitrate stocks are low—but more of this later.

Up to the present we have spoken as though there were just a single species of this *Rhizobium* or nitrogen-fixing bacterium. Actually there are a large number of strains, which are each limited in their activities to certain plants or groups of plants. It has been found that

there are a certain number of so-called "cross-inoculation" groups of plants, and any one *Rhizobium* can only work in association with plants within one particular group. For instance, the cowpea, poona pea, velvet bean, and lima bean lie within one group, while lucerne, the sweet clovers, the trefoils, and melilotus constitute another group, and so on. Now, the *Rhizobium* species which forms nodules on the roots of the members of the first group, will not form them on members of the second group, and *vice versa*. Therefore the fact that land has grown an excellent crop of poona pea does not mean that it contains the right bacteria for the growth of, say, New Zealand Blue Lupin.

Plate 21.

Roots of soybean plants showing nodules produced by nitrogen-fixing bacteria.

But not only do we have different groups of bacteria which will not work in association with other groups of leguminous plants, but there is a great variation in the efficiency of the strains within any one group. The meaning of this statement will best be illustrated by summarising some experiments with poona pea and soybeans, which were the right bacteria for the growth of, say, New Zealand blue lupin.

In view of what we believe to be the increasing importance of legume culture it was considered desirable to initiate some experimental work with a view to finding highly efficient strains of *Rhizobium* which could be used for the inoculation of crops at planting time. Consequently, cultures were collected from laboratories in various parts of the world, and, in addition, some cultures were isolated from the nodules of very well-grown Queensland crops.

Plate 22.
Nitrogen-fixing bacteria taken from a root nodule. Magnified about 1,500 times.

In order to test the efficiency of the various strains the seeds are inoculated and then planted in sterilized sand which is free of plantfood. We use medium-sized earthenware pots, of the type exhibited, waterproofed to prevent evaporation. The plants are grown in a glasshouse, and every care is taken to prevent contamination with bacteria which might blow in with dust. The plants are watered with a sterilized solution of plantfoods from which nitrogen is missing—that is to say, they are forced to get their nitrogen from the air.

Cultures for the Poona pea group were obtained from Western Australia, South Australia, Victoria, New South Wales, and Queensland, while soybean group cultures came from England, Canada, United States, and Australia. It is of interest to note that as far as these two crops are concerned the most efficient strains were isolated in Queensland from very well-grown crops at Cairns and Lawnton respectively.

In Plate 23 will be seen a reproduction of Poona pea plants which were inoculated with a good strain (Cairns) and a medium strain (New South Wales) and the check uninoculated pot. Although these plants are young, it will be seen that the inoculation with the right strain has made a wonderful difference in growth—a difference which will become

more marked with increasing age. While the differences in actual growth are not so marked in the case of the soybean it will be seen (Plate 24) that the smaller plants are also light in colour, showing nitrogen deficiency, while chemical analysis showed that the better strains produced a considerably higher nitrogen content.

Plate 23.
Poona pea plants grown in sterilized sand. No. 7 inoculated with a good strain of nitrogen-fixing bacteria. No. 8 medium strain, No. 9 not inoculated.

We would also direct attention to the formation and distribution of nodules in both Poona pea and soybeans. In the case of the highly efficient strains the nodules are concentrated around the crown of the plant, while with the less effective strains the nodules may be equally or more numerous, but they are scattered through the root system. The roots of the uninoculated plants bear no nodules, and neither did the roots of a Poona pea plant which was inoculated with a strain specific to the New Zealand blue lupin.

So much, then, for the theory of green manuring; we will pass now to the consideration of a few points of field practice. We have seen that while legumes will grow in soils containing adequate nitrates they will also grow vigorously in nitrogen-starved soils provided they can make contact with an efficient strain of the proper species of nitrogen-fixing bacteria. For the full development of the plant it is not only necessary that the particular strain be present but that it be present in large numbers in order to ensure early and complete nodulation. When planting any legume, therefore, the wisest course to take would be to inoculate the seed with the appropriate culture immediately before planting. This is a very simple operation, and is now widely practised in the United States, where there are several commercial organisations which culture and sell inoculum for various crops. In Australia, both the Western Australian and New South Wales Departments of Agriculture sell for a nominal price cultures for the inoculation of seeds of

Plate 24.

Soybean plants grown in sterilized sand. Nos. 5 and 4 were inoculated with nitrogen-fixing bacteria, while No. 10 was not inoculated. Note white sickly leaves of uninoculated plant.

some eight to ten groups of leguminous plants. It is proposed to continue our search for highly productive strains, and, on completion of this work, it will be possible for us to set up a similar service for Queensland cane farmers should they so desire it. Of course, the provision of the right strain of *Rhizobium* is only part of the story, and the crop will not grow if seed bed, moisture, and general plantfood balance are not right.

These nitrogen-fixing bacteria require that soils shall not be too acid, and they also like phosphates. Thus, farmers on land which requires liming (as tested by Bureau officers) should apply lime before planting, and a dressing of phosphate should be made where this plantfood is deficient.

However, one of the most important factors in the restriction of the activities of these bacteria is the presence of considerable amounts of nitrates in the soil. When there is sufficient nitrate present for the good growth of the plant without any nitrogen fixation taking place, the bacteria slow down on the job, and may form no nodules and actually become parasites of the plant. Under these conditions you may get an excellent crop, but it has only been a cover crop, and has not netted you the equivalent of a few hundredweight of sulphate of ammonia, which it should have done. Therefore, the right time to plant a green manure crop is when the nitrate supplies of the soil are low—that is, as soon as practicable after harvest, and while rotting of roots, trash, &c., is still going on.

Under the influence of moisture and warmth the organic matter of the soil is converted into nitrates by other forms of bacteria, and if a field is ploughed out and fallowed before or early in the rainy season there will usually be considerable nitrate reserves available by late autumn. If, then, a winter-growing legume is planted a good crop will result if weather conditions are favourable, but there will have been

little or no nitrogen fixation. Thus the crop will have been a cover crop but not a green manure crop in the strict sense of the term. Consequently, if only a single leguminous crop is to be grown, it should be planted before the old stubble and crop debris has had a chance to rot; if a second crop is to be planted, then it should be sown while the first crop is still in a state of decomposition.

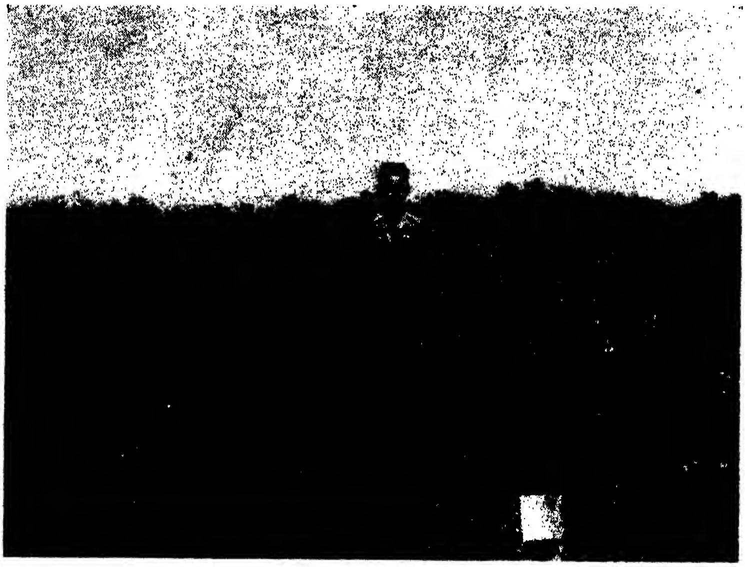


Plate 25.
Summer crop of *Crotolaria goreensis* grown on the Bundaberg Sugar Experiment Station.

Green manuring, then, should be done with one eye on the future, but with at least half an eye on the past history of the field.

MOLASSES FOR FATTENING LAMBS.

In a recent publication received from the State of Washington, U.S.A., are interesting details of an experiment to determine the value of beet molasses as a feed for lambs. The molasses, which was fed in quantities varying from ½ to 1 lb. per lamb daily, was diluted with three parts of water and poured over the solid feed of maize and hay.

From the data obtained it is calculated that 2,000 lb. of beet molasses are equal in feed value to 1,704 lb. of maize and 978 lb. of hay. The market grade of the lambs fed various rations showed that those which received supplementary molasses were very little inferior to those which were fed maize only, and it was concluded that the value of the two feeds was dependent upon the relative price of maize and molasses.

Under Queensland conditions molasses in the coastal areas would be by far the cheaper feed, and the possibilities of this by-product in supplementing the ration of fattening lambs is evident.

—*H. W. K., in "The Cane Growers' Quarterly Bulletin."*

Further Notes on Spray Irrigation.*

H. W. KERR.

INTRODUCTION.

THE subject of spray irrigation for cane has been brought before this Society on a previous occasion, when an experimental system installed by the Bureau of Sugar Experiment Stations was described. A new type of sprinkler was later described, and the officers of the Bureau have constantly been on the watch for a spray system which could be regarded as suitable for the cane farmer, while being free from the objection of high installation cost or high working pressure; both of these factors have operated against the systems hitherto discussed.

The notes here presented represent an attempt to keep this subject before growers on irrigated lands, in the hope that it may be possible to devise a scheme which would be practicable, or adaptable to Queensland conditions. Flood (or furrow) irrigation has been the standard practice of the canegrower, but it is fully appreciated that certain shortcomings attend this method, notably its unsuitability for broken country, or very sandy soils, while the unavailability of skilled field hands for this duty, particularly when watering is performed but intermittently, is no small problem in itself.

During recent months the writer has learned of the development both of new sprays and modified methods of application of water, and these will be described and discussed briefly.

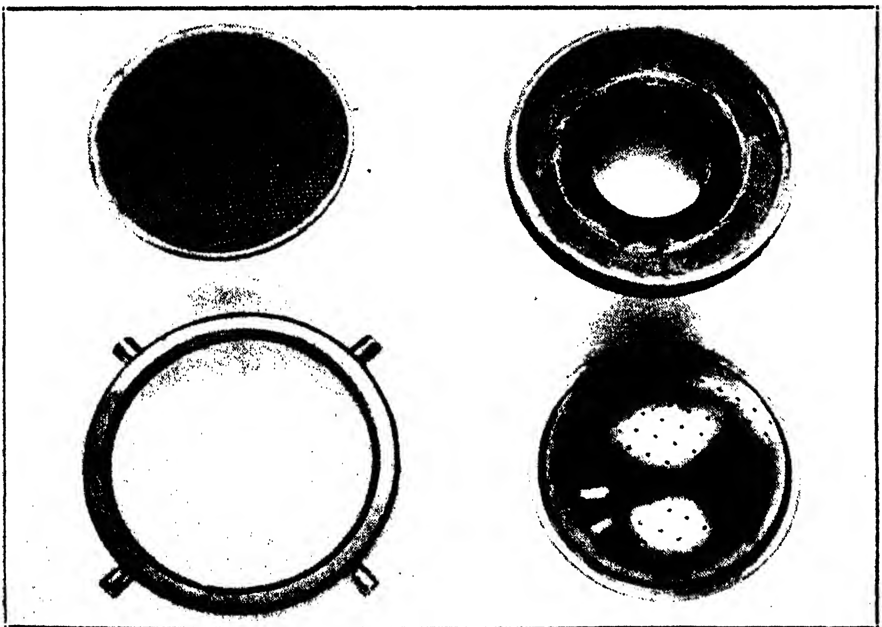


Plate 26.
Illustrating the separate parts of the spray described.

* Paper presented at the Bundaberg Conference, Queensland Society of Sugar Cane Technologists, 25th February, 1938.

NEW SPRAY NOZZLE.

In Plates 26 and 27 is illustrated a spray nozzle which appears to possess some definite advantages over similar low-pressure devices. The major features of the spray are the accompanying strainer, to eliminate most of the dangers of chokage, and the disposition of the holes on a hemispherical distributor to provide even watering over a *square* plot, instead of the customary circle. The holes have been drilled in such a manner that the outer rows deliver more than those more centrally placed, and an even distribution results. Plate 28 illustrates the spray in action.

The operating nozzle pressure is 15 lb. per square inch, and at this pressure the volume of water delivered may be varied by selecting the appropriate distributor. The distributors are made in three grades, as follows:—

	Application per hour (acre-inches)
8 rows of 8 holes	1·00
9 „ „ 9 „	1·26
10 „ „ 10 „	1·56

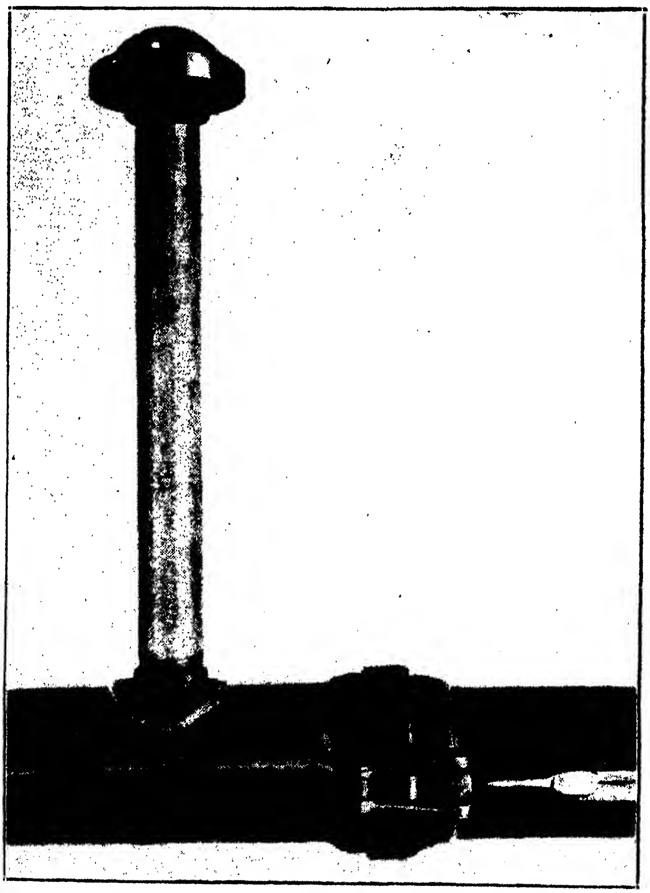


Plate 27.

Showing the assembled spray and short standpipe attached to clip-jointed fluming.

The coverage of each spray is a square of 35 feet side, when attached to a standpipe 1 foot high. This necessitates about thirty-six sprays to cover an area of 1 acre at a time.

With a crop such as cane it would be necessary to place the spray on a standpipe of greater height than that suitable for, say, lucerne. The increased height would give substantially greater coverage for the spray, but also adds to the difficulty of transportation if a portable system is desired. In certain areas of Queensland where farmers are desirous of irrigating only during the (normally) dry spring and early summer, it would be possible to use a 6-foot standpipe, and this should not introduce any trouble during transportation.

The adaptation of the height of standpipe to stage of development of the crop could also be considered. It would be neither very costly nor troublesome to employ, say, 3-foot standpipes for young cane and 6-foot pipes when the height of the cane demands it.

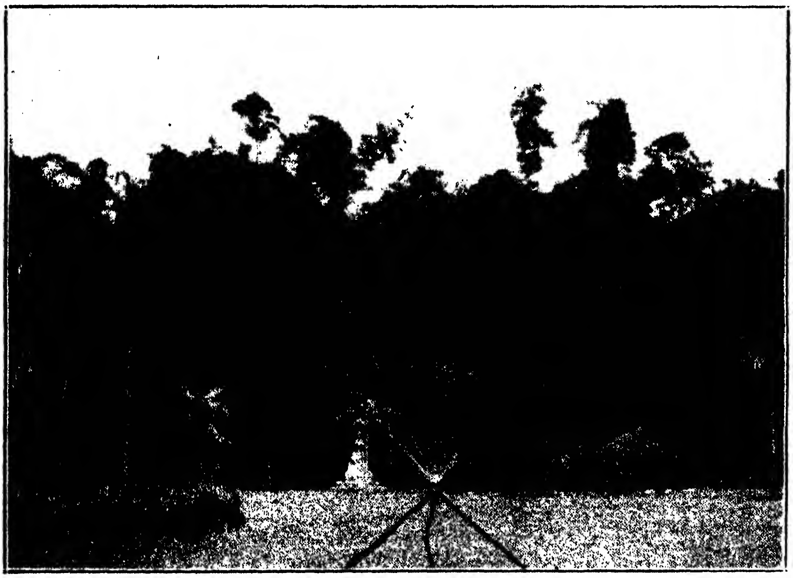


Plate 28.
The spray operating at 15 lb. nozzle pressure.

SUITABLE LAYOUT.

To illustrate how such a spray system could be employed as a portable unit, a layout will be described in which a particular enquiry is dealt with. The grower in question has an area of sandy loam soil, approximately 20 chains in width, and divided into two almost equal parts by a permanent creek which runs through the length of the farm. By damming the creek, it would be possible to bring the water within, say, 8 feet of the level of the fields, which are virtually flat. A schematic layout which would involve the use of a tractor, with pump attached, is shown in Plate 29, for which the following description applies:—

By means of a flexible hose, the water is drawn from the creek, through a footvalve and strainer, and forced by the centrifugal pump through, say, three lines of sprays, set at intervals of 35 feet, for use

with the unit already described. The field is 10 chains in length, and each spray line would therefore require nineteen sprinklers. Each sprinkler (say, sixty-four-hole type) delivers about 10 gallons of water per minute, so that fifty-seven sprays, in three lines, will distribute

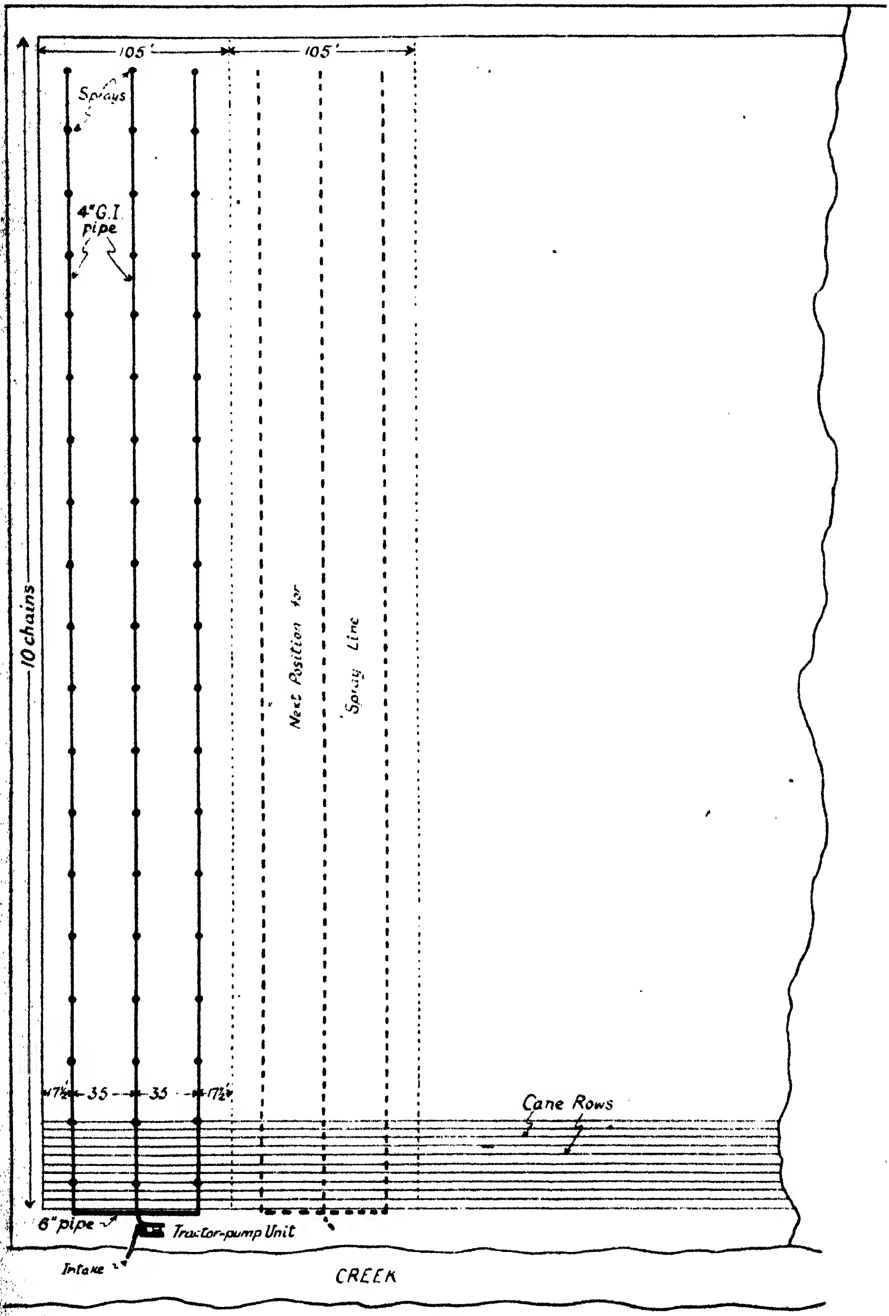


Plate 29.
Schematic layout of portable spray system for sugar cane (*see* text).

approximately 35,000 gallons of water per hour. This quantity would be delivered by a 5-inch pump. The headland main fluming could be 5 or 6 inches in diameter, while for the three laterals 4-inch round fluming would suffice.

The total head against which the pump would operate, with the above layout, would be approximately 70 feet, and the power required, 20 b.h.p. By employing 5-inch fluming for one-third the length of laterals, friction losses would be minimised, and the power required reduced by about 15 per cent. Such a layout (Plate 29) would apply 3 acre-inches to 1·6 acres in 3 hours, when the system would be uncoupled and transferred 105 feet across the field. By using clip-jointed fluming (*see* Plates 27 and 30), fitted with compression rubber rings, this would present no difficulty with the lateral fluming. The tractor could be employed, if desired, to transport the four 17-foot 6-inch lengths of larger main, as well as the flexible hose coupling and intake pipe, when moving to its new position. Assuming that three strips (or 4·7 acres) can be sprayed in a 12-hour day, the system could take care of 47 acres where fortnightly waterings are desired.

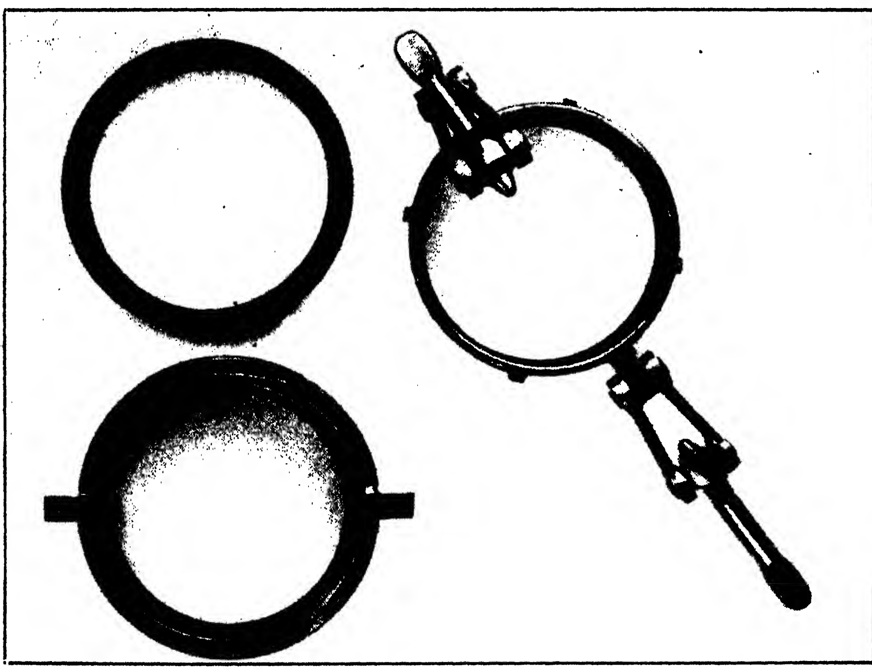


Plate 30.
Illustrating the separate units used in an effective clip-joint for fluming.

The cost of the complete distribution unit (but *excluding* tractor and pump) would be about £200. Care should be taken to obtain heavy gauge fluming (say, 22 gauge) and, before use, protect it with a coating of tar or similar preparation if it is to be employed with water of a corrosive nature.

SOUTH AFRICAN SPRAY SYSTEM.

Recently we read of a new system of spray irrigation which has been developed for cane in South Africa. Although further details were sought, these have not been received to date; but it would appear that a tractor-pump unit is employed, operating on the headland and drawing water from a ditch which is supplied by gravitation from the neighbouring hills. The pump forces the water through a nozzle, mounted on an elevated platform, and it is claimed that the water is distributed "for about 70 yards in all directions, and, in windy weather, for much greater distances." The device appears to possess a definite value on hillsides, as it largely eliminates the danger of washaways, as are associated with furrow irrigation under these conditions.

LOW PRESSURE OVERHEAD SYSTEM.

The chief drawbacks to most overhead spray systems which have been advanced for cane irrigation are—(*a*) the high cost of pipe-line capable of withstanding the high pressures developed, in an attempt to give wide coverage to each spray, and (*b*) the increased pumping costs involved due to the nozzle pressure required.

The writer recently inspected a model of an overhead distribution system which, it is claimed, will effectively overcome

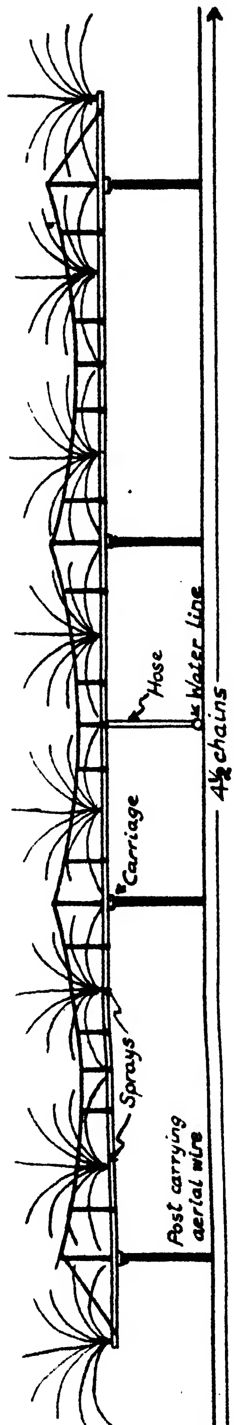


Plate 31.
End elevation of overhead spray system (*see text*).

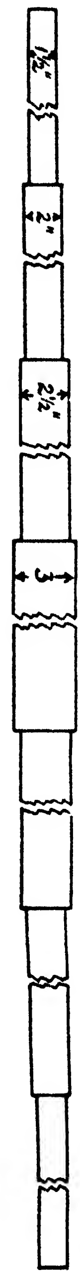


Plate 32.
Illustrating how the weight of the distributor and load could be minimised by a progressive reduction in diameter of pipe.

these drawbacks. The unit consists essentially (Plate 31) of a pipe-line (up to 4 or 5 chains in length), mounted on simple carriages, with grooved wheels, to allow the pipe-line to be drawn across the field on heavy gauge overhead wires. It is proposed that one tightly-stretched wire per chain of distribution line will be adequate. The pipe-line would be fitted with suitable sprays, and that already described (*see* Plates 26 and 28) should be quite satisfactory. The distribution unit would be supplied with water from a centrally placed pipe-line, laid on the ground and running the length of the field. This would deliver the water under the necessary pressure by means of a flexible connection to the distributing unit.

Certainly such a system is decidedly unique in character, but it does possess some definite advantages, if it should prove to be practical. It would be necessary to construct this distributor rigidly but lightly, and 22-gauge galvanized iron could be used. To ensure a minimum of water load, consistent with ample dimensions to eliminate undue friction losses, progressive reduction in diameter of pipe (*see* Plate 32) would be desirable. Such a distributor would hold about 50 gallons of water, and the total load on each wire should not exceed 200 lb. The length of aerial wire (10 chains) would demand a number of intermediate supports, to avoid the undue tension which would be necessary to keep the wire taut. Most of these supports need be only temporary, and these could be moved to a new position each time the position of the distributor is altered. The even movement of the carriages over the wires might give some trouble, unless two suitably spaced cables attached to one windlass be employed.

Perhaps a better plan would be to support the distributor on 14 lb. (portable) rails, instead of wires. To equip the field permanently in this way would be, of course, prohibitive; but if three lengths (each 35 feet long) were available in place of each wire, it would be possible to transport one to its new position while the distributor rested on the remaining pair. Permanent posts to carry the rails would, however, be necessary; on the other hand, it should be possible to make two, or at most three, rails do the work of four wires. Double-flanged wheels for the carriages should then eliminate possible difficulties in the regular and even movement of the distributor. It is evident that such a system would require very accurate installation, in respect of distance between wires (or rails) and care to ensure even distribution of the load over all wires. Topographical irregularities would introduce difficulties also.

The patentee claims that the carriages could be kept in continuous slow motion, while watering, by employing a sufficient length of flexible hose to connect the distributor to the pipe line. Detachment of the hose and re-connection at a new point in the line could be made at intervals of 100 feet, thus requiring about 45 feet of hose. It is felt that the cost of the 4-inch hose required, and difficulties for the distributor in "dragging" this with its load of water, could best be avoided by having direct connecting points at 35 feet intervals, and changing the position of the distributor intermittently, say, every 3 hours, where a 3 acre-inch application is desired.

It will be noted that the layout described and illustrated would water only 4½ acres, with fields 10 chains in length; to water the adjacent strip of 4½ acres, it would be necessary either to transport the distributor

to a new series of aerial wires, or have a separate unit for each strip of the field. Transportation of the empty unit should not prove a difficult matter, particularly if built for rapid dissembling.

It should be stressed that the writer has not seen this ingenious device operating under field conditions, and no data are available for actual installation costs. Such posts and supports as are necessary for the aerial could probably be found on or near the farm, and installed by the farmer. Aerial wire of 6-gauge would cost about £2 for 9 chains—the amount required per acre on the layout described. Portable rails would, of course, be more costly; twelve 35-foot lengths (using four lines to carry the distributor) would cost about £15. These would be sufficient for the entire area served by one distributor, so that the cost *per acre* would be little more than for the wire.

If the pipe-line feeding the distributor were of galvanized wrought iron pipes, laid permanently, the cost would be excessive. But by employing portable 4-inch clip-jointed fluming, of 22-gauge galvanized iron, the system would be cheapened very considerably. The cost of 10 chains of 4-inch fluming would be approximately £50.

On the proposed plan (Plate 31) eight sprays would deliver about 5,000 gallons per hour, thus requiring but a small pump (say 2-inch), driven by a 4 h.p. engine. An irrigation of 3 acre-inches could be applied to nearly 1 acre per 12-hour day. For a large area it would therefore be necessary to install, say, four such units, fed by a portable main pipe-line of greater diameter (7 inches) laid on the headland. By this means it would be possible to operate three units at a time (while the fourth is being set up in its new position), and an area of 30 acres could be watered per fortnight. A substantial increase in area covered could also be effected by using the nozzle which applies 1½ acre-inches per hour, and/or by operating for a longer period each day.

CONCLUSION.

It is hoped that the sketchy details presented will stimulate further thought on the subject of spray irrigation. Any system will necessarily require adaptation to meet local conditions; the question is not a simple one, but the inventive mind of our canegrowers, who have solved so many cultivation and other farming problems in the past, should ultimately result in the evolution of a system which will prove both effective and economical.

WHAT SOIL ANALYSIS MEANS.

Many farmers are under the impression that in finding out the fertility of their soil, all that is necessary is to hand a small sample of soil to the agricultural chemist for him to say what that particular type of soil will grow. In other words—that when we know the percentages of plant food in a soil sample we can decide straightaway whether the soil will grow a good, bad, or indifferent crop, and that if we make up any deficiency in the plant food the soil lacks we can rest assured of a bumper harvest. It is not so simple as all that, however, but nothing worth while is easy, on the land or anywhere else.

What chemical analyses give us is an idea of the total amount of plant food a soil contains, but it does not indicate the amount available for different crops. Other factors—such as location, mechanical condition of the soil, bacterial life, and so forth—have an influence in determining the suitability of soils for various crops. The best way of finding out what fertilizer and how much is required, is by actual trials. The instructor in charge of any local experiment plot will be a good guide in these matters.

Soil samples, taken according to printed instructions issued by the Department of Agriculture and Stock, may be forwarded for examination for acidity and physical consistency. When such an examination is made, in conjunction with a report of an extension officer of the Department, the information desired by the sender can be

Sheep-drenching.

REPORTS have been received from sheep owners at various times of ill-effects following the use of the nicotine sulphate and bluestone drench, which is advised for the removal of hair worms from sheep. This drench is perfectly safe providing the sheep owner knows when and how to use it. Where it is followed by ill-effects, these are usually due to:—

1. *Careless Mixing.*—Nicotine sulphate is a highly poisonous drug; therefore the mixing of the drench should be given every care. The nicotine sulphate is measured in fluid ounces and not in ounces weight.

2. *Careless Administration.*—The majority of ill-effects which have followed the use of this drench are due to careless administration. The dose given depends not only upon the age, but also upon the condition of the sheep. The recommended doses are for sheep of various ages in fair to good condition. If the condition of the sheep is low, the dose should be reduced about one-fourth.

If the drenching is hurried, a portion of the fluid may enter the lungs of the animal with fatal results. It requires only a very small quantity of nicotine sulphate to kill a sheep should it reach the lungs. In hurried drenching, which is most frequently the case where automatic drenching guns are used, the tissues of the mouth and throat may become cut or bruised. The nicotine sulphate is rapidly absorbed through these wounds with frequently disastrous results.

While the nicotine sulphate and bluestone drench is highly effective against stomach worm, it should not be employed where a heavy stomach worm infestation is present. Under such circumstances this drench becomes dangerous, as it may be rapidly absorbed into the body.

In sheep which are suffering from stomach worms, bluestone alone should be used.

It is always wise before drenching a flock to find out which species of worm is responsible. This can be readily determined by killing and examining one of the most affected sheep.

Bugle Sheep Drafting Yards.

J. L. HODGE, Instructor in Sheep and Wool.

The accompanying plan of sheep drafting yards gives every satisfaction.

Two men and a good dog can, without difficulty, draft three ways as many sheep as the yards will hold.

In addition a race is supplied for jetting sheep for blowfly.

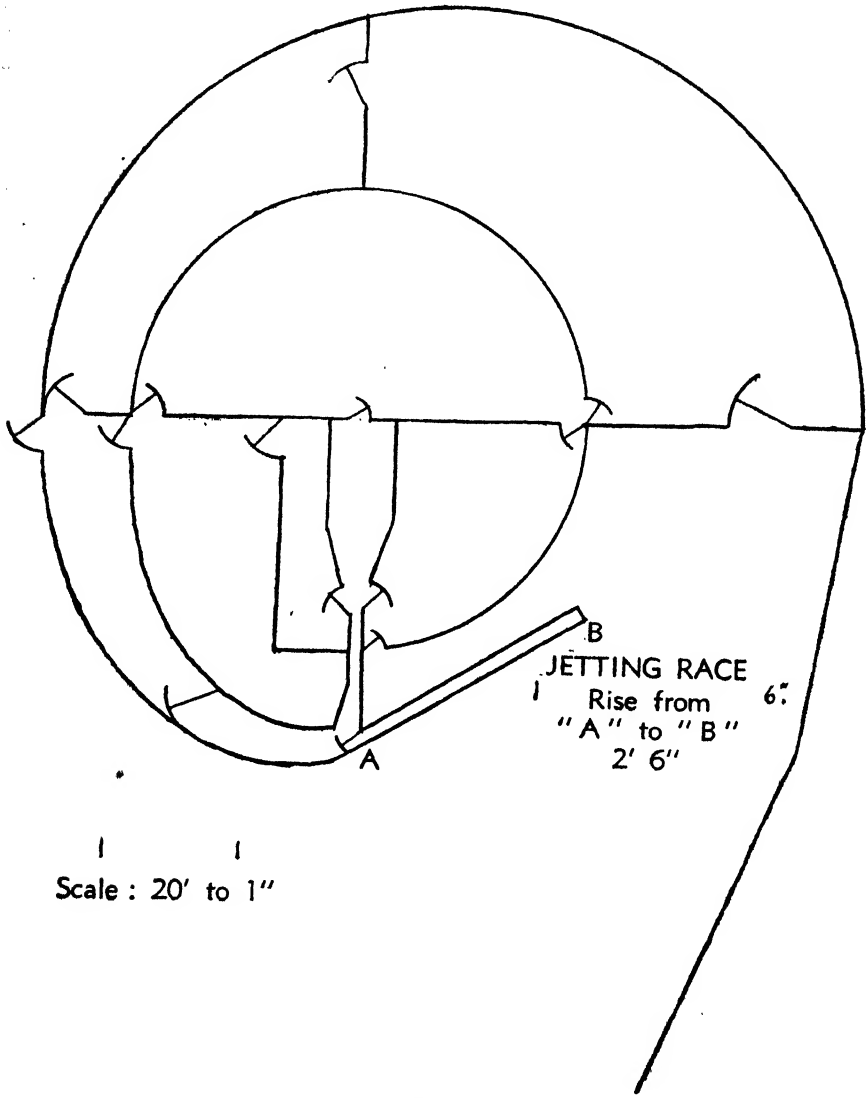


Plate 33.

The yards were erected by Mr. George Wheeler, Speeling Point, Cunnamulla.

This set of yards is confidently recommended for adoption by graziers planning similar improvements.

CLASSING THE EWE FLOCK.

Many grazing properties in Queensland are now stocked well up to their carrying capacity, and, with the coming crop of lambs to be provided for, some reduction in numbers will be necessary. Besides being more profitable, it should give the owner far more satisfaction to have a flock as near as possible to uniformity in type and which will cut a heavy fleece of good quality wool.

On most large holdings, classing the ewe flock forms part of the station routine, and there is no reason why smaller flocks should not be classed in the same way.

Just before shearing is the most suitable time to do the classing and, usually, the flock can be classed in three groups to advantage. The tops should consist of all the large-framed deep-bodied ewes carrying a covering of even type, well grown, and showing the character and colour typical of the breed. Ewes selected for the main flock should be as free from fault as possible, but need not be so even or up to the standard of the tops. The third class will be the culls, including light cutters, ewes producing inferior wools in quality or colour and ewes rejected for defective frames, weak constitution, or objectionable folds or wrinkles. The rams to be mated with them should be classed in the same way, the best being selected for the top line. All culled ewes should be fattened, and sold as soon as possible; the same may be said of those cast for age.

—Jas. Carew.

PREPARATION FOR SHEARING.

The shearing season will soon commence, and it behoves graziers to give that necessary attention to the shed, plant, and yards in plenty of time before the start.

Starting is often delayed, because everything has been left to the last minute. The shed itself should be clean, and all pen gates and hinges seen to to ensure convenient working. Grating floors, also, should be attended to where necessary.

The down shoots should be carefully repaired, if necessary, thus ensuring that shorn sheep are not ripped by outjutting nails, splinters, or other projections. Counting-out pens nearly always need repairing. The branding race and the gates at both ends should be in good working order.

Inside the shed, all machinery should be overhauled, belts examined, hand-pieces attended to, and oil cans ready.

The wool bins may need a nail or two, new rungs may be required in the wool-rolling, piece-picking, and classing tables.

The wool press should be overhauled thoroughly and the ropes examined, for if new ropes are necessary, rigging them is a long job.

Have wool packs placed conveniently near the press, and all tools used in pressing in their places. Scales should be tested and every other detail attended to. If this work is neglected until the commencement of shearing, delays and frayed tempers are inevitable.

—J. L. Hodge.

Pastoral Notes.

LUNG WORMS IN CATTLE AND SHEEP.

Lung worms in cattle and sheep may become serious during late winter and spring. As a rule only the young animals are affected and lung worms should be suspected in any animal showing loss of condition, accompanied by spasms of coughing, signs of suffocation, and scouring. Such symptoms may also be shown by animals which are suffering from a disease of the lungs brought about by some cause other than lung worms. In calves, for example, there is a type of pneumonia caused by bacteria, in which the symptoms are very similar to those associated with lung worm infestation. As the pneumonia due to lung worm infestation and that caused by the bacteria require entirely different treatments, it is always wise to kill an animal in which the disease is far advanced, and examine the lungs. If lung worms are present they will be seen readily, as they occur in bunches in the air tubes of the lungs surrounded by a blood-stained froth.

If the diagnosis is confirmed, the remainder of the animals affected with lung worms should be removed immediately to warm dry quarters, and drenched in order to remove other species of worms which might be present in the stomach. This procedure, whilst it does not affect the lung worms directly, increases the animal's resistance to them. Infested animals should be given plenty of nourishing food to build up the animal's strength.

In very severe cases, an injection of certain drugs can be made through the windpipe to expel the worms. This operation is not without risk, and in cases where an injection is desirable the assistance of the local stock inspector should be sought.

Further details regarding the drugs to be used for drenching and for injection into the windpipe may be had on application to the Animal Health Station, Yeerongpilly.

—*Dr. F. H. S. Roberts.*

TRUCKING YARDS.

Some bruising of stock occurs in the trucking yards, and it is quite commonly held that this is unavoidable. Suitable design of yards and races and quieter working of stock are the answers to this fallacy.

In moving cattle from yard to yard or pen to pen, there is some congestion just before, during, and just after passing gate or race. It is obvious that at such places rails should be flush with the posts and padding used where the fence makes sharp angles. It is equally obvious that working must be very steady to avoid jamming and, consequently, bruising—more particularly with the outside beasts. To prevent undue crushing at the approach, it is best to have the fences funnel- or V-shaped. If the wings are long and the gate wide the working is not slowed up and the number that can pass through is regulated well back, so that a jam does not occur at the actual place of passage. After passing through, there should be no obstructions to prevent fanning out. For this reason, a straight fence forming a side of two yards is not desirable when a corner gate is used.

When working cattle through one yard to another, gates should be opposite each other—i.e., in a direct line with the direction in which the beasts are streaming. The wings to a crush should both converge. It is bad practice to have one wing in a direct line with one side of the crush. This is often the case when an existing fence is used for one wing. As cattle work better uphill, the loading-out race or crush should be slightly inclined upwards to the truck.

TREATMENT OF CATTLE AFTER TICK FEVER INOCULATION.

Inoculation of cattle for tick fever is widely practised in Queensland, and it is not realised by many owners that unless reasonable care is exercised, unsatisfactory and, maybe, disastrous results can follow. For this, there are many reasons.

In the first place, it has to be recognised that one is using a vaccine containing "live" organisms—that is, parasites that, given a chance, may exert themselves and produce death of the animal inoculated. The risk of the parasite overcoming the animal depends largely on the treatment the animal receives.

It is known that aged fat animals, bulls particularly, are more susceptible. Were it not for the fact that young cattle are usually more resistant, cattle raising would be almost impossible where ticks are present, because in the young newly-born animals the mortality would be far too high. As the animal grows older its resistance decreases, and when fully mature its susceptibility may be very high. Notwithstanding this general rule, instances occur where young cattle do suffer severely when inoculated.

During the "reaction" to inoculation, there is, as it were, a battle between the invading parasites and the organs of the inoculated beast. In most cases the animal wins, and then becomes what the owner describes as "immune." In this "immune" condition, there is a nicely adjusted balance between the animal and the tick fever parasite whereby the parasite lives in the animal, but causes no injury to it. In other words, there is a compromise—the animal and the parasite both continuing to live, neither doing the other any harm.

Should, however, any other factor be introduced which will debilitate or weaken the animal, particularly during the "reaction" stage, then the tick fever parasites may win the contest and the animal dies.

For this reason, cattle must be carefully treated after inoculation. They must not be driven or disturbed—no long train journeys, no driving and no hardships of any kind. Bulls must not be worked. Cows carrying calves must have especial care, particularly those advanced in pregnancy. Of course, it is not advisable to inoculate such cattle, but an owner may find this unavoidable if, say, he has bought mixed lines and is obliged to shift them as early as possible.

The drug caprin which is now used throughout Queensland is of very great value in controlling tick fever. It must, however, be used in time. The evidence in regard to its use is overwhelming and many valuable animals are now saved which a few years ago would have died.

Two things are therefore important. Firstly, the animals inoculated must be kept under careful supervision during the first few weeks after inoculation; and, secondly, obviously sick animals must be given a dose of caprin.

—*Dr. John Legg.*

CARE OF THE DIP.

Cattle owners in ticky country often neglect their dipping vats. Consequently, they often unconsciously lose money, for cattle dipped recently in a dirty vat lose their bright, clean appearance, which helps the seller when the bidding in the sale ring is brisk.

In the course of time a dipping vat will accumulate a considerable quantity of filth which settles slowly on the bottom as a deposit of sludge. It may become so bad that an owner is forced to empty the vat, and is then put to the expense of recharging.

This can be avoided by cleaning the vat periodically. For this purpose a kerosene tin is cut in half diagonally to make a scoop, which is attached to a handle with wire. Small holes are cut in the bottom and sides. After dipping cattle the surface of the fluid may be skimmed with the scoop and floating hair and dirt removed. This helps to keep the vat clean for a long time.

After dipping, the sump should also be cleaned and dirt prevented from accumulating.

A white mark should be placed on the side of the vat to show the height of the fluid. It will be noticed, particularly in hot weather, that evaporation is very rapid, and the surface of the fluid will fall far below this mark. Before next dipping, water can be added until the dipping fluid is again at the correct level. It is only the water that evaporates—not the concentrates.

—*Dr. John Legg.*

VEALER CALVES.

Provided a calf is kept on the mother to allow it to reach a live weight of about 80 lb., a satisfactory return is assured when marketed. Large numbers of calves are being slaughtered annually for export as boneless veal, and the trade has reached such proportions that buyers are usually operating in all dairying districts. It is well worth while to keep the calf for a few days before selling for slaughter. A calf responds quickly to a few days' suckling, and this can quite easily mean the difference between an underweight and overweight calf—a matter of at least 5s. in its value.

A Substitute for Milk in Pig Feeding.

L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

IT is known generally that meatmeal is a good substitute for separated milk in the pig's diet, but unless it is used carefully meatmeal may prove an expensive food.

Meatmeal, which is a by-product of abattoirs and meatworks, is sold under several trade names and some varieties contain a small percentage of bonemeal. It is wholesome food, convenient to use, and costs from 9s. to 10s. 6d. per 100-lb. bag, Brisbane, the higher-priced brands containing a higher percentage of protein.

As meatmeal is expensive in comparison with pig foods grown on the farm, it should not be used more freely than is necessary.

Separated milk, which meatmeal replaces, is used according to its availability, pigs sometimes receiving milk as their sole diet, but pigs will thrive on small quantities of milk used in combination with grain and other foods such as pumpkins and sweet potatoes; the milk supplies a part of the protein necessary to balance the ration. Each pig from weaning until baconer stage and each dry sow should receive a minimum of three-quarters of a gallon of separated milk daily, and each sow with a litter double that quantity.

When these minimum quantities of separated milk are not available, meatmeal may be substituted, using about ½ lb. of meatmeal to replace each three-quarters of a gallon of separated milk.

Pigs thrive on a mixture of milk and meatmeal, or meatmeal alone as the protein-rich portion of the diet. The quantities used should not exceed from ¼ to ½ lb. daily per pig from weaning to baconer stage, according as to whether good lucerne is available or not; and ½ lb. for each dry sow and 1 lb. daily for each sow with litter.

By feeding a constant quantity of separated milk or meatmeal, and increasing the grain and other foods according to the pig's appetite, the nutritive ratio is widened automatically as the pig grows and satisfies its requirements.

In cases where pigs have access to good young pasture or green crops, the minimum quantity of separated milk or meatmeal stated above may be reduced by up to 50 per cent., depending on the quality of the green foods.

Meatmeal may be fed dry or mixed with milk or water.

HINTS ON FEEDING.

Grain feeding enters largely into successful pig raising; consequently, the form in which it is fed is important. Pigs which have been fully fed with corn through their growing period usually make good use of the whole grain, and corn-in-cob feeding may be adopted. Animals fed with corn only occasionally may not masticate it thoroughly, and a waste is incurred. For these, a preliminary cracking is advisable.

Well-ground grain is usually fed only to stud animals or stock for exhibition.

The appearance of whole grain in the dung may induce pigs to eat excreta. This is a clear-cut case for grinding.

Milling by-products are usually fine, and this may be a disadvantage when the pens are in an exposed position or during windy weather. The waste may be considerably reduced by wetting.

There is no need to prepare pumpkins or squashes, beyond the breaking of hard-skinned varieties—e.g., ironbark pumpkins.

Most tubers may be fed as harvested, or the pigs may be allowed to harvest them for themselves. It is advisable to cook potato "culls."

Milk, milk products, seed cake preparations, meat and blood meals, and cereal by-products require no preliminary treatment.

Lucerne or other roughages are usually well masticated by older pigs, and young pigs eat such small quantities that there is no point in chaffing.

KEEPING PIGS HEALTHY.

By the general practice of hygiene and sanitation in the piggery, coupled with sound feeding methods, the incidence of most pig diseases can be considerably reduced.

Moisture is necessary for the free living stages of nearly all worm parasites; in its absence very few of them can survive for any length of time. Therefore, pig keepers who wish to avoid losses from worms must have dry, well-drained piggeries.

Unhygienic conditions are predisposing causes of rheumatism, catarrh, and some of the more serious bacterial infections—such as supurative otitis and pneumonia.

Correct feeding and watering, together with adequate housing and paddocking, are undoubtedly most important factors in the preservation of the health of the pig.

THE KEEPING OF BREEDING RECORDS.

On every farm where the farmer breeds his own pigs some form of breeding record should be kept, for a record of the productivity of each sow, as well as a herd average, will contain information of much value to the observant breeder. Such records are not difficult to set out, and but a few minutes would be required each week to keep the book up to date. Therefore, a very small expenditure of time and money will ensure a supply of information which may be the means of adding materially to the income from the piggery.

A simple record may be prepared in the following way:—Take an ordinary exercise book or card, and across the top of two facing pages, or the card, rule two lines, between which the breed, name, and date of birth of the sow may be written. Then rule vertical lines to the bottom, and in the spaces between these lines there should be written such information as date of service, date of farrowing, number born, number weaned, pigs sold or killed for meat, gross returns, and remarks. In the remarks column, a note should be made of any pigs born dead, the causes of losses up to weaning, and deaths after weaning, as well as remarks concerning the type and growth rate of the litter.

When a complete breeding record is kept for each sow on the farm, the owner can, by studying the individual records, note the sows which have had small litters, or have not reared litters well, and so on. Therefore, if a sow's performance is not good, she should be replaced. By doing this, the average for the herd is raised, to the ultimate benefit of the owner.

Another use for records is to compare the results obtained from different foods. By feeding different rations to groups of pigs, and keeping a record of the amount of food eaten and the weight increases made on different rations, the farmer can determine for himself the foods which will give the greatest gain in weight for the least cost or labour.

The useful information to be gained from breeding records does more than merely compensate for the brief time and light expense involved.

—*T. Abell.*

MAN AND GRASS.

Dr. R. G. Slade is reported to have declared before the British Association for the Advancement of Science that it is possible to obtain 700 lb. of crude proteins from an acre of grass which would make useful food for pigs and also, in an emergency, a nutritious and palatable ration for the people. He added that all arable land in Britain, if sown with grass, could provide enough food to feed forty million people. There is nothing very wonderful about that. As a matter of fact the human race literally lives on grass to-day. The flesh foods we eat and the milk we drink are really grass once removed. If there were no grasses, all stock would perish, and mankind would perish with them. It is quite possible, therefore, that science may discover a better way of utilising grass and making it fit for food than by raising stock. Vegetarians like Bernard Shaw will hail the new discovery with loud applause. It may be that in the future science will succeed in transforming grass into the most delicious of foodstuffs and enable the glutton to revel in seductive dishes without having to resort to the wholesale slaughter of the pig, the sheep, and the bullock.

—*The Australian Dairy Review.*

YIELD OF CARCASE IN PORK AND BACON PIGS.

The loss of weight in transit of a pig from farm to factory, and then during dressing, varies greatly, and it is not possible to say exactly what weight a pig will lose.

Factors which affect the amount of loss are:—The size of the pig (the larger pig will lose a lower percentage); the manner in which the pig had been fed; the distance of the journey from farm to factory; the conformation and condition of the pig and the amount of food contained in its alimentary tract when it is weighed alive.

In tests it has been shown that under conditions similar to those ordinarily ruling in Queensland, pigs weighing 150 lb. to 200 lb. alive on the farm lose about 10 per cent. of this weight in transit to the factory, and then another 20 per cent. in dressing. Lighter pigs, weighing 100 lb. to 140 lb. alive, usually lose approximately 33 per cent. by the time they are dressed. Whilst these figures possibly are a fair average, individual pigs vary considerably according to the factors already mentioned.

As a rough guide in estimating dressed weight from live weight, farmers usually take seven-tenths of the live weight for baconers and two-thirds of the live weight for porkers.

—*L. A. Downey.*

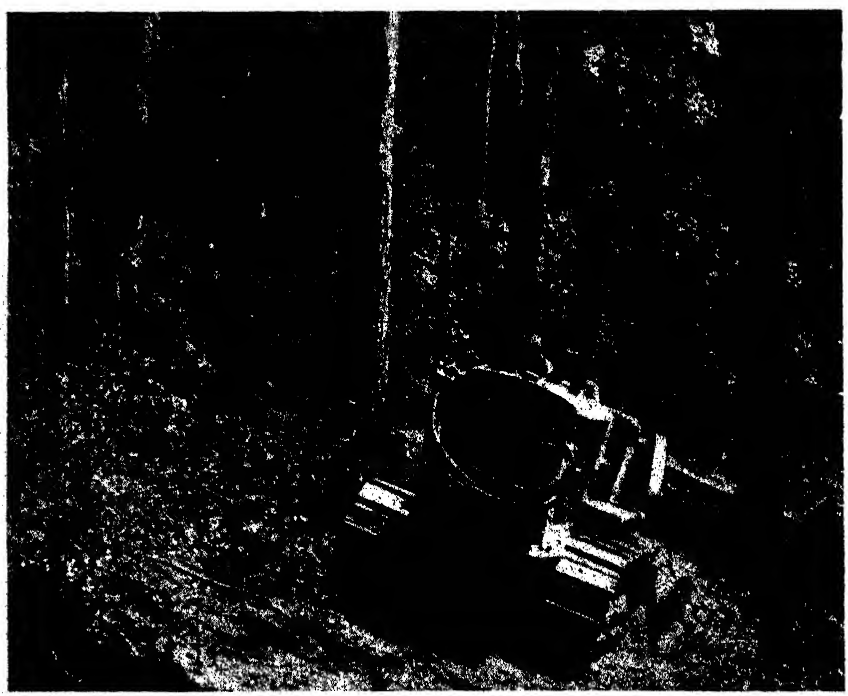


Plate 34.

Timber hauling with a tractor in a Queensland forest.

[*Photo.: Foresty Service.*

Feeding Dairy Cattle in Winter.

MANY farmers conserve enough roughage to last their dairy herds through a severe winter, but few understand why the milkers fail to keep up production. Mastication and digestion of dry roughage use up at least 60 per cent. of the energy value of the feed. With concentrates, less than 20 per cent. is used. It follows that very often on poor quality roughage a cow is either unwilling or unable to consume enough to meet the requirements of full lactation. The trouble might be met in two ways. Extra consumption can be stimulated by increasing the palatability of the food. Molasses thinned out with water is excellent for this purpose. Bran and other milling by-products may also be used when prices are reasonable, but it appears unlikely that, for this year, cereals or their by-products will be able to compete with other concentrates.

Seed cake preparations are excellent for dairy cattle. On account of its slightly laxative nature, linseed has found greatest favour. There is a growing tendency to replace vegetable proteins by animal protein. Meat and animal protein meals are used extensively when analyses and prices are sufficiently attractive. By consulting the registered analyses and comparing costs, the farmer can determine which product is the cheapest to buy. All farmers who have overcome the cow's natural dislike for meat and animal protein meals have been amply repaid by the money saved and by the increased production. Under certain conditions, however, it may be uneconomical to feed such concentrates. This is usually the case with poorer milking herds.

The farmer should add a mineral supplement to the ration of all milkers, as well as heavy-in-calf cows. A mixture of two parts sterilised bone meal and one of salt should be kept in a convenient place, or about one eggcupful mixed in each feed. With heavy milkers, the allowance might be doubled.

LOW PRODUCTION COST.

Many dairy farmers supplying milk have cows capable of giving more than the one or two gallons they produce, but the owner is generally sceptical as to whether the extra food required will be paid for out of increased production.

A simple trial lasting a fortnight will show how to rearrange both feed and production. Arrange for those cows which can be reasonably expected to produce more to get the extra feed. It should take the form of concentrates. A simple mixture for the production of an extra gallon is 3 lb. of maizemeal and 1 lb. of high-quality meat meal. Gradually bring the animals under test on to the full feed—usually a week is adequate. Test over a further week.

The cost would not exceed 7d. daily per cow. The increased yield in terms of cash then determines whether the particular cows under test are worth the extra feed. If they are, then it will pay to pension off low producers and apply the cost of their food to the purchase of concentrates for the proved animals.

In practically all cases the food for two half-gallon cows or one one-gallon cow costs more than the extra feed which is to produce an extra gallon from a better milker.

The saving in labour is also worth consideration.

COMFORT FOR COWS ON COLD NIGHTS.

The dairy farmer who rugs his cattle during wintry weather usually reaps the advantage of an undiminished cream return. Many other farmers would like to follow suit, but are deterred by the cost of buying a good warm rug. There is no reason, however, why a farmer so placed should not make his own cow rugs. All that is required are the necessary number of corn sacks, a ball of twine, a packing needle, and ordinary ingenuity.

A warm rug can be made out of two corn bags, but for a big beast three bags might be necessary. Split the bags down the seams, sew them together, and place on the cow. After getting the right fit, cut off a strip of bagging so that the rug will not hang too low. This strip cut off may then be folded and sewn to the rug as a thigh strap. The front of the rug is then fitted by turning up the corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion, which the cow would otherwise tread on. Neck and other fastenings may be easily fashioned to make the rug complete.

This home-made rug will keep the cow warm, and after a few days' wear will become practically waterproof. The rug can be slipped off and on quite easily, and it is advisable to remove it every day, except in bleak or rainy weather. Each cow's name may be painted on its own rug. Rugging will certainly increase winter milk production.

STERILIZATION OF DAIRY UTENSILS.

More bacteria are added to milk and cream from improperly washed and ineffectively sterilized utensils than from any other source. While the methods of washing on some farms are reasonably sound, the sterilization practised is frequently ineffective.

Steam sterilization is very satisfactory, but unfortunately, it cannot be done on every farm.

Boiling water, however, can be made available in every dairy; and, if effectively used, will annihilate all but the most resistant micro-organisms. A common, but undesirable practice is to obtain the boiling water from the kitchen stove. While the pouring of boiling water on utensils is to be commended in ordinary circumstances, the effectiveness of the sterilization is reduced considerably when the boiling water has to be removed from the kitchen to the dairy, with a consequent drop in temperature.

The best results are achieved by the provision of a boiler in the vicinity of the separator room or dairy house. For this purpose, a 12-gallon boiler has been stipulated under the Dairy Produce Acts. To obtain thorough sterilization, the utensils should be immersed in the boiling water for at least ten minutes.

The time and trouble taken by the farmer in the regular sterilization of his milk and cream utensils will be repaid amply in the consistently good grading and keeping quality of his product.

BORDER LINE CREAM.

Every factory manager must formulate a policy in regard to the lowest quality cream that can be manufactured into choice quality butter at his particular factory. Modern methods of manufacture and factory equipment have done much to enable the utilisation of cream, which a few years ago would have been discarded. Nevertheless, the dairying industry still offers no exemption to the general rule—that the quality of raw materials directly influences the character of the manufactured product. The addition of a few faulty cans of cream to a vat may thus cause the spoilage of otherwise choice quality butter. Only a thorough knowledge of the origin and nature of a given defect can help in determining the fate of doubtful cream.

There is a limit to the capability of machinery and manufacturing technique to offset defects in cream quality, and no factory can afford to slur over defects in the cream received. Any laxity in this respect is really doing the farmer a disservice, for he may remain unaware that better quality cream is required, and takes less instead of more care on the farm.

First-quality butter can only be obtained when the farmer realises that the remedy for cream defects is essentially his responsibility.

—*J. D. W. Ogilvie.*

Registered Hatcheries.

OBJECT OF REGISTRATION.

THE registration of hatcheries has for an object the distribution of healthy chickens, the progeny of parent stock of good type and production ability.

The following clauses of Regulation 29 of "*The Diseases in Poultry Acts,* 1923 *to* 1937," will indicate the obligations of owners of Registered Hatcheries:—

(iv.) He shall have all poultry at or upon or kept at or upon such hatchery tested for pullorum disease at the times and in the manner from time to time required by the Chief Poultry Expert. He shall pay to the Minister the cost of every such test.

(v.) He shall not place, permit, suffer, or allow to be placed in any incubator at such hatchery for the purpose of incubation, any egg which shall be less than 2 oz. in weight.

(vi.) He shall not sell or offer for sale any chickens other than chickens which are healthy and normal and shall not sell or offer for sale any chickens which are deformed or injured in any way, or which have weak navels.

(vii.) He shall at all reasonable times permit the Chief Poultry Expert, any Inspector, or any officer to enter into or upon such hatchery and inspect the same.

Following is a list, giving the name of the owner of the hatcheries registered up to and including 30th June, 1938:—

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Novertire . .	White Leghorns, Australorps, Rhode Island Reds, and White Wyandottes
F. J. Akers, Eight Mile Plains . .	Elmsdale . .	White Leghorns and Australorps
J. Cameron, Oxley Central . .	Cameron's . .	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard . .	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville . .	White Leghorns
R. B. Corbett, Woombye . .	Labrena . .	White Leghorns and Australorps
T. G. Crawford, Stratford . .	Rho-Isled . .	Rhode Island Reds
Rev. E. Eckert, Head street, Laidley	Laidley . .	Australorps, White Leghorns and Langshans
Elks & Sudlow, Beerwah . .	Woodlands . .	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	. .	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. . .	White Leghorns
J. W. Grice, Loch Lomond . .	Quarrington . .	White Leghorns
C. & C. E. Gustafson, Tannymorel	Bellevue . .	Australorps and White Leghorns
F. J. Lambert, Acacia Vale, Townsville	Lamberts . .	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns
A. Malvine, junr., The Gap, Ashgrove	Alva	White Leghorns and Australorps
H. L. Marshall, Kenmore . .	Stonehenge . .	White Leghorns and Australorps
W. J. Martin, Pullenvale . .	Pennington . .	Australorps, White Leghorns, and Black Leghorns
J. A. Miller, Racecourse road, Charters Towers	Hillview . .	White Leghorns
F. S. Morrison, Kenmore . .	Dunglass . .	Australorps, Brown Leghorns, and White Leghorns
F. J. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
G. Pitt, Box 132, Bundaberg . .	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, White Wyandottes, Sussex, Rhode Island Reds, and Brown Leghorns
C. L. Schlencker, Handford road, Zillmere	Windyridge . .	White Leghorns
E. E. Smith, Beerwah	Endcliffe . .	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview . .	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield . .	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
T. Westerman, Handford road, Zillmere	Zillmere . .	Australorps and White Leghorns
P. A. Wright, Laidley	Chillowdeane . .	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's . .	White Leghorns, Brown Leghorns and Australorps

Following is a list of persons who have applied for registration:—

Name and Address.	Name of Hatchery.	Breeds Kept.
J. W. Moule, Kureen	Kureen . .	White Leghorns and Australorps
E. K. Pennefather, Oxley Central	. .	Australorps and White Leghorns

PREPARED POULTRY FOODS.

The domestic fowl appears to have no sense of smell and but little of taste. The senses of sight and touch, however, are very keenly developed, so that it becomes important to prepare poultry foods in attractive form. The fowl relies largely on past experience in accepting food, and for that reason feeding problems must be always a subject of close study.

Excessively fine, dusty foods—e.g., some biscuit meals—should never be fed without some preliminary treatment. They tend to cause clogging in the month, and fine particles lodged in the respiratory tract are a source of irritation. There also is the additional danger of distended crops. Such dry foods should be incorporated carefully in a mash and, if necessary, moistened.

A food which is flaky but not brittle is well taken by fowls—hence the popularity of bran in mashes. Hard grains should be crushed or ground coarsely. Soaking is an alternative method of helping the gizzard to cope with hard foods.

Predigested, fermented, or malted foods are actually lower in nutritive value than the material from which they are derived, and, in normal circumstances, should not be purchased.

BREEDING FOR EGG PRODUCTION.

In breeding poultry, the farmer should exercise the utmost care in order to establish and maintain a high quality flock. Considerable progress has already been made in the improvement of breeding practice. Egg production has been increased from about sixty eggs to over 200 eggs per bird per annum, many individual pullets laying over 300 eggs in a year.

In dealing with the egg production in a flock of birds consisting of an equal number of pullets and hens, many authorities quote twelve dozen as a fair average annual production. It is doubtful, however, whether there are many poultry farmers in Queensland who obtain an average production per bird of less than thirteen dozen eggs yearly. In some experiments conducted at the Animal Health Station, using White Leghorns purchased from a poultry farmer as day-old chickens, the average production over the two years was 181 eggs per bird, the variations being—pullet year, from 194 to 209 eggs; second year, from 155 to 162 eggs. In these experiments, 116 pullets were used, and the average of the two years was over fifteen dozen eggs, and even these birds in their second year laid over thirteen dozen. The birds were kept under poultry farm conditions.

The poultry farmer should be able to obtain an average production at least equal to those figures. A constant high average production is only obtainable by good breeding, in conjunction with good management and feeding.

The chief considerations in establishing standards of good breeding are:—Type, constitutional vigour, action, and laying characteristics. Having selected birds reasonably true to type, care must be taken to see that they are of strong constitutional vigour. This is indicated by the vitality, stamina, health, brightness, and alertness of the bird, and is of equal importance to the knowledge of the actual number of eggs laid.

As an example, some years ago the first three birds in a laying test laid 302, 296, and 294 eggs, respectively. An examination of these birds at the conclusion of the test showed that the first and second birds were weak in constitution, whereas the third bird was very strong. All these birds were used as breeders, but while the progeny of the first and second hens were disappointing layers, the descendants of the third bird have performed very well in laying tests every year since. That example should emphasise very clearly the necessity for rejecting birds that are weak constitutionally.

Admittedly, it takes courage not to breed from a 300-egg bird. If such a bird produced the eggs without a heavy drain on her body, she would be constitutionally strong. If, however, the bird rapidly loses condition during the year, she is obviously weak in constitution and, consequently, would probably be an indifferent breeder. Any bird that is unable to stand up to a heavy season's laying without losing condition cannot be expected to give high-laying progeny, and should be discarded, irrespective of other characteristics.

—*J. J. McLachlan.*

Plate 35.

Outlook over the New South Wales border from a spur of the Macpherson Range.

Agricultural Notes

Winter Preparation of Land for Maize.

TO get the best results, maize requires a good soil in which a plentiful supply of plant food is available—a condition which can only be brought about by an early and thorough preparation of the land before planting, attention to the cultivation of the crop itself, and to the eradication of young weeds during its early growth.

The land should be ploughed to a depth of at least 9 inches during winter and allowed to lie in the rough until early spring. The action of frost and rain will improve the texture of the soil and will leave it in a mellow condition. In early spring, the land should receive a second ploughing whch, if possible, should be a cross ploughing. This should not be so deep as the first ploughing, and should be followed immediately by a harrowing and cross harrowing to work the surface soil into a fine tilth.

If a crop of weeds is turned under during the second ploughing, planting should not be carried out for at least a few weeks to allow decomposition to take place. On land which is not too heavy and moist, rolling is desirable as it consolidates the soil and helps to make a good firm seed-bed. Rolling should always be followed by a light harrowing.

Preparation of Seed-beds.—The preparation of the seed-bed is one of the most important points in the production of maize. No amount of after cultivation will undo the damage that has been caused by planting in a badly prepared piece of land.

One has only to see the difference, not only in the growth but also in the colour of the foliage between a crop grown on thoroughly prepared and another on hastily prepared land, to realise how great the effect is.

Give the young crop a chance to become well established in a well prepared seedbed—in which the young plants will not have to battle with a host of weeds—and the increased return will more than compensate for the extra time and labour spent.

Time to plant.—The best time to plant will naturally vary in different districts. In districts which have a long growing season and a comparatively regular rainfall, planting can be done whenever weather conditions are suitable, from August to late December.

Two very important points are—firstly, to choose a variety which is suitable for the district; and, secondly to plan to have the crops tasselling, if possible, during periods in which rain can usually be expected. Maize must have moist conditions when tasselling, and if hot, dry winds occur during this period, the pollen is shed too early and fertilization cannot take place.

Seed should be sown in drills spaced 3 ft. 6 in. to 4 ft. apart. The wider spacing is essential for the tall-growing, late-maturing varieties. As a general rule, single spacing in the rows gives the best results, the grains being dropped singly, with a distance of approximately 12 inches between the grains for the quick maturing varieties, and from 15 to 18 inches for the late maturing varieties.

From 9 lb. to 12 lb. of seed is sufficient to plant an acre, when sown in this way.

The seed drill is the best implement for sowing maize, as it ensures a good even spacing and no loss of moisture occurs during planting, as is often the case where furrows have to be opened up for hand planting.

THE PRESERVATION OF CONCRETE ON THE FARM.

Concrete floors and feeding troughs on the farm often show signs of wear soon after being laid down, a fault which is often due to the action of various acids in milk and some other foods. If the farmer does not take steps to prevent further wear, the concrete becomes pitted and quickly breaks up.

This deterioration of the concrete may be delayed successfully by the correct use of a special type of silicate of soda, which is cheap and easy to apply. When mixed with water the solution thus obtained is sprinkled on the surface of the concrete to be treated, is absorbed, and combines with the concrete, forming a tough coating which is impervious to water and acids under ordinary farm conditions.

One gallon of the special silicate of soda is thoroughly mixed with 4 gallons of water. The 5 gallons of solution will suffice for three applications to an area of 300 square feet of average concrete. Very dry or porous concrete will require a fourth application.

In making new concrete floors, the work should be finished off so that the surface is not very smooth, otherwise the stock will be liable to slip when it becomes wet. When the concrete is firm and nearly dry the solution of silicate of soda in water is applied by means of a spray pump, a watering-can with a fine sprinkler or a mop. Do not flood the solution on, but apply just as much as the concrete can absorb readily. A second and later a third application of the solution should be made as the surface dries out each time. For new concrete, three coats should be sufficient.

Worn floors and troughs may be renovated in the following manner:—First, the surface should be thoroughly scrubbed with soap and hot water to remove grease and dirt. Then the area is coated over with a mixture of one part cement to three parts clean, fine sand. When the concrete is firm and drying, treat with the silicate of soda solution as for new concrete.

Floors and troughs in sound condition will benefit by treatment with silicate of soda. The surface should be freed from grease as before mentioned; four applications of solution will probably be necessary, and twenty-four hours after the last application any solution remaining on the surface should be removed with a mop.

Concrete floors and troughs treated in this way last longer, are easier to clean, and dry more quickly than untreated concrete. For best results, the concrete should receive a light treatment once each year following the initial treatment.

When purchasing silicate of soda for conditioning concrete, farmers should definitely state the purpose for which it is to be used to ensure his obtaining the correct material.

—*T. Abell.*

GROW MORE FODDER CROPS.

Every year, producers in the Maranoa and Western Darling Downs districts are confronted with the difficulty of maintaining the condition of stock during the winter months, when pastures are short and harsh. There is only one way out, and that is to take advantage of the better types of soil available and grow fodder crops—not in a haphazard, casual way, but by using a system by which land is given a fallow period prior to the planting of each crop.

The recent bountiful rains throughout these districts provided an opportunity for making a commencement with a fodder programme, and, in view of the erratic seasonal conditions usually encountered, every advantage should be taken of the moisture now in the ground. Many settlers have winter crops—such as wheat, oats, or barley—germinating now, and an excellent practice, particularly after the heavy rains experienced, is to give the crop a light harrowing as soon as the plants have a good hold in the soil. This should be done at right angles to the direction of sowing to check weed growth, prevent evaporation, and give plants a better chance to stool.

Following planting and harrowing, attention should be given to land intended for summer fodders such as Sudan grass, sorghums, Japanese millet, and cowpeas. There is every temptation at present to utilise every acre of available cultivation for sowing winter crops now, whether the ground is ploughed or not. In the very rare years when good winters are experienced plough and plant methods may work out to some advantage, but far better results, on the average, will be obtained if a systemised cropping programme—including rotation of crops and fallowing—is adopted. Wherever possible, therefore, land which has not been prepared for winter crops should be ploughed and left in the rough state for early spring planting. In this way, moisture at present in the ground will be retained, and even light rains in spring will permit planting at that time. Apart from moisture conservation, the aeration of soil by fallowing oxidises plant foods and makes them more readily available to the growing crop.

—*C. H. Defries.*

MANAGEMENT OF WINTER PASTURES.

The choice of a pasture mixture for winter grazing has to be based on a number of factors, including the average winter rainfall of the district, the chemical and physical characters of the soil, the cultivation treatment the land has received, the length of time the pasture is expected to remain, and the aggressiveness of weeds. Once a suitable mixture has been established it must not be considered "fool-proof," but should be managed with due regard to the pasture itself.

The temptation to overstock paddocks during winter when the "broad acres" are unproductive must be resisted. Such pastures should as far as possible be reserved for cows in milk, for breeding ewes, or for fattening stock. The pasture should not be stocked too early in the growing season but should be allowed to make good growth before grazing. When a paddock is ready for grazing the animals should be permitted to graze on it for about an hour each day and they should be removed sooner if they begin to lie down. Camping on the area should be prevented, as the pasture becomes fouled and distasteful to the stock. Sufficient stock should be put on to eat a paddock down within ten days or so, but the pasture must not be too closely grazed. "Flogging" a pasture of winter grasses and clovers will certainly be harmful. After the completion of a grazing, the harrows or wooden drag should be run over the paddock to scatter the droppings. The pasture must be given ample time to recover and produce good growth before being grazed again. Sufficient paddocks of winter pasture should be provided to permit rotational grazing and to supply green, nutritious feed continuously throughout the cooler months of the year.

Certain of the annual winter pasture plants—e.g., Italian ryegrass, Wimmera ryegrass, and prairie grass—are self-seeding, and towards the end of the growing season pastures of these grasses must be left unstocked in order to permit the seed to ripen and shed. Areas which have been so treated should be lightly harrowed in early autumn to make a seedbed for the establishment of seedlings produced by the self-sown seed.

—*C. Winders.*

SHRUBBY OR UPRIGHT MIST FLOWER.

The common Mist Flower, a decumbent plant bearing numerous sprays of small white flowers, is a very abundant weed of some of the wetter areas in South-East Queensland and Northern New South Wales. Recently, specimens of an allied kind have been received from several localities in South-East Queensland, particularly in the Nerang Valley.

It is an upright plant of shrubby growth, usually with numerous branches. The stem is four to six feet high. The Department of Agriculture and Stock advises that, fortunately, it does not seem to be of as aggresive a type as the more decumbent and weaker species, and, where necessary, it can, usually, be eradicated by grubbing it out.

Species of Mist Flower are grown in Europe and United States of America for florists. They are rather ornamental and because of this, may be left standing or sometimes even fostered.

Neither the common Mist Flower nor the shrubby species is known to possess any poisonous or harmful properties at any stage of growth.

—*C. T. White.*

VARIETY P.O.J. 2878 AND DOWNY MILDEW DISEASE.

With its many virtues, the Java Wonder cane (P.O.J. 2878) possesses two very distinct weaknesses—susceptibility to Fiji and downy mildew diseases. Although these were relatively unimportant diseases in Queensland a few years ago, they assume quite a different aspect in the Bundaberg and Mackay areas with the continued planting of a susceptible variety.

Our recent inspections of certain parts of the Mackay district show that a high proportion of the fields of this variety carry downy mildew disease. The widespread character of the disease has therefore necesitated the removal of the cane from the variety lists supplied to local boards this year in the Farleigh, Racecourse, Pleystowe, and Marian mill areas, with the exception of those lands lying north of The Leap.

This precaution has been taken in the interests of other susceptible canes now grown as major varieties. With a continuance of plantings of diseased P.O.J. 2878, the situation could become very serious.

Though the cane has been retained in the lists for North Eton, Cattle Creek, and Plane Creek, similar action will be taken should the disease be found subsequently in these areas. Growers should remember that P.O.J. 2714 is also susceptible to the disease, though P.O.J. 2725 is resistant.

It is felt that, with the full co-operation of all growers in reporting the existence of the disease on their farms, the district could be rid of this trouble, and P.O.J. 2878 re-introduced in a few years' time in a healthy condition.

—*H. W. K., in "The Cane Growers' Quarterly Bulletin."*

PERMITS FOR TRANSFER OF SUGAR-CANE PLANTS.

In order to reduce the possibilities of carrying sugar-cane diseases from one district to another in which those particular diseases do not exist, it is necessary that strict precautions be taken in the matter of transferring cane plants from one area to another. In futherance of this object the State of Queensland has been divided into a number of quarantine districts, and under the provisions of the Diseases in Plants Acts the transport of sugar-cane plants from one such district to any other is prohibited unless a permit has been issued by an inspector under the Acts. The boundaries between these quarantine districts consist of imaginary lines drawn east and west through Cardwell, Townsville, Bowen, Alligator Creek (south of Mackay), Rockhampton, Burrum, the southern end of Great Sandy Island, and Brisbane. Any person desirous of sending cane plants across any of the above boundaries at any time during the current season, should make an early request for the necessary permit, to the Director, Bureau of Sugar Experiment Stations, Brisbane.

THE NEW SEEDLING Q.2.

The following notes have been compiled for the guidance of North Queensland farmers, who will soon be commencing the 1938 planting programme.

A further year's experience with Q.2 has confirmed its promise of a vigorous plant crop with satisfactory sugar content if cut in the latter half of the season; it definitely is not an early-maturing cane. It has proved somewhat disappointing as a ratooner, and it should not be harvested early in the season, although when cut late some excellent ratoon crops have resulted.

For the guidance of farmers we have collected data on eleven experimental plots harvested in the far North. The time of harvest was recorded, and later the plots were inspected and the crops classified according as they appeared to be good, fair, poor, very poor, or a failure. For the purposes of enabling ready comparison we have constructed a graph (see Fig. 43) to show the relation between vigour of ratoon crop and time of harvesting. It will be seen that there is a gradual improvement in the ratoons as the harvesting is delayed, and these results strongly suggest that this operation should *not* be carried out before mid-September.

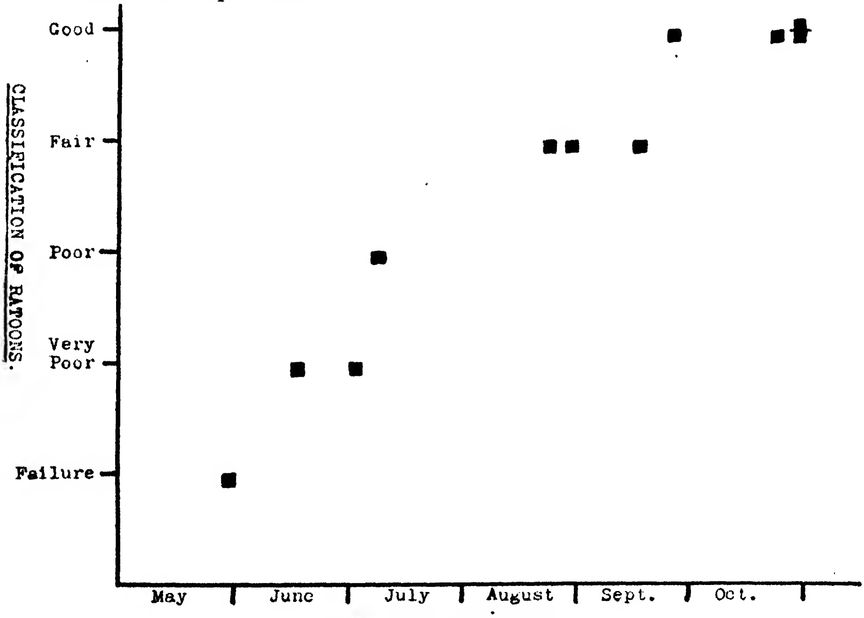


Plate 36.

Showing that Q. 2 gives a good ratoon crop if the plant cane is harvested after mid-September.

Several series of observations of flooded cane made in the Johnstone area by Mr. Knust indicate that this cane is considerably more "resistant" to flood damage than Badila. Doubtless this is mainly due to the fact that, Q.2 being considerably taller than Badila, the growing point is submerged for a shorter period of time than would be the case with Badila.

The previous season's indications of resistance to top rot and borer attack were again in evidence.

—*G. B., in "The Cane Growers' Quarterly Bulletin."*

DWARF DISEASE IN P.O.J. 2878 AT MACKAY.

Farmers in the Rosella area of the Mackay district will recall that some years ago some alarm was caused by an outbreak of an entirely new disease—Dwarf Disease. Fortunately, later experience showed that the disease remained restricted to low-lying farms or low-lying portions of farms in that area, and with the almost complete elimination of P.O.J. 2714 the disease virtually disappeared. Recently a few farmers in this "dwarf country" have tried plantings of P.O.J. 2878, but inspections carried out early this year have indicated that some of these crops have contracted dwarf. As a result farmers in this area are warned against making extensive plantings of P.O.J. 2878, and are urged to make no such plantings whatever in low-lying fields. The area has been very closely surveyed by Mr. McDougall, who should be consulted regarding proposals for planting P.O.J. 2714 or P.O.J. 2878 in this locality.

—*A. F. B., in "The Cane Growers' Quarterly Bulletin.*

SELECTION OF PLANTING MATERIAL IN THE MULGRAVE AREA.

Owing to the necessity for planting gumming resistant varieties to replace S.J. 4, farmers will to some extent be forced to go outside their own farms in order to obtain plants. In this connection it is well to sound a warning that a small amount of leaf-scald and downy mildew (or leaf stripe) exist in the district. Consequently, when deciding upon a source of supply of plants, great care should be taken to see that plants of susceptible varieties are not taken from the neighbourhood of these diseases.

The Java Wonder cane, P.O.J. 2878, shows marked susceptibility to downy mildew, as also do the other high numbered P.O.J. canes, with the exception of P.O.J. 2725.

The two gumming resistant varieties, Korpi and Oramboo, which are now being grown to some extent in the Mulgrave area, are rather susceptible to leaf scald, and in building up stocks of these two canes care should be taken to see that supplies are obtained from disease-free sources. This disease has been seen in several blocks of these two varieties in the Mulgrave district, and hence the need for greater care. As this disease is spread by the cane knife it follows that the cutting of only a few diseased stalks can infect a large number of future stools when cutting plants.

Farmers in doubt as to the suitability of particular fields are urged to get in touch with the Experiment Station at Meringa, or Mr. G. Bates, Instructor in Cane Culture, Cairns.

—*A. F. B., in "The Cane Growers' Quarterly Bulletin.*

WIREWORM DAMAGE IN MACKAY.

Forecast for 1938 Season.

Summer rainfall conditions in 1936 and 1937 were extremely favourable to the development of young wireworms of the "lowland" type, with the result that damage to newly planted fields was both widespread and severe; in many cases wholesale ploughing out and replanting was rendered necessary. Rainfall conditions during the current year have not been favourable, however, and it is confidently expected that wireworm damage to this season's plantings will be comparatively scarce and will be confined to very low-lying areas. Most of the "dips," hollows and lower ends of fields situated in the better type of river bank soils should be free of the pests, while moderately well improved forest country should yield satisfactory strikes unless some factor other than wireworms operates.

—*W. A. McD., in "The Cane Growers' Quarterly Bulletin."*

VARIETAL TRIAL.

A varietal trial was set out on the farm of Mr. A. Grieve, Pine Creek, Bundaberg, with a view to determining whether P.O.J. 2714 is superior to P.O.J. 2878 under the local conditions.

Unfortunately, the crop suffered rather much from adverse growing conditions, and the yield results from the plant crop are therefore presented with reservations:—

Variety.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.
P.O.J. 2714	11·9	**14·0**
P.O.J. 2878	**12.8**	13·1

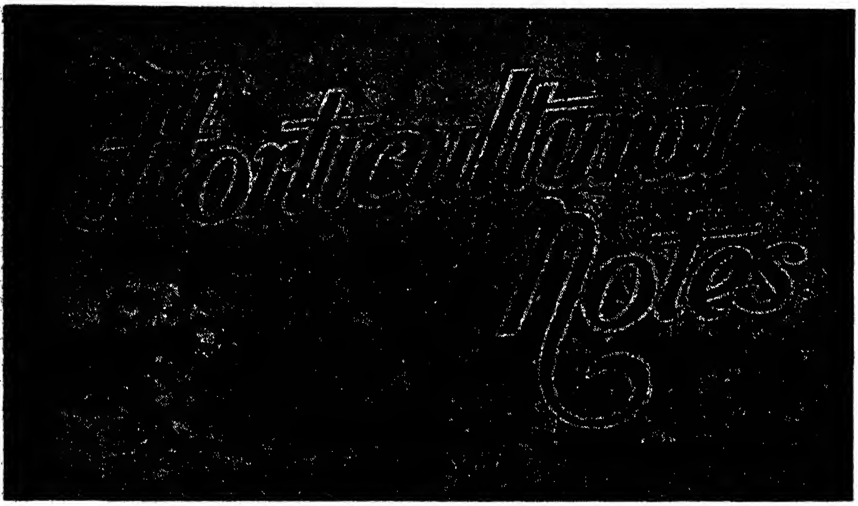
It will be observed that there is nothing decisive about the results. While P.O.J. 2878 gave a slightly higher tonnage per acre, the c.c.s. of P.O.J. 2714 was somewhat superior.

—*H. W. K., in "The Cane Growers' Quarterly Bulletin."*

BUTTER EXPORT.

The leader of the British Delegation at the Empire Producers' Conference in Sydney has given an assurance to the Australian Dairy Produce Board that the Dominions need not fear restrictions of exports of dairy produce to the United Kingdom. The conference decided to ask Empire Governments to pass legislation for the setting up of marketing boards on the request and by vote of the producers concerned.

Because of the falling off in butter production in Australia, the Australian Dairy Produce Board has decided to restrict exports of butter to 1,500 tons weekly, for the present. Our export quota is 2,000 tons weekly.



How to Plant a Deciduous Fruit Tree.

H. ST. J. PRATT, Senior Instructor in Fruit Culture.

FROM the time trees leave the nursery until they are permanently planted, they should never be left exposed to sun, wind, or air, when it can be at all avoided.

Trees waiting for planting should be heeled-in with moist earth about the roots, and only taken out of the ground when actually needed for setting. The hole dug for a tree should be large enough to permit the roots to spread out naturally in all directions. It is unnecessary to dig wide holes if the trees are heavy-rooted, for the roots must be trimmed back at transplanting time.

All broken, torn, and dead roots should be cut back to fresh living wood. When the clean cut surfaces come in contact with moist soil, new roots are formed very readily.

Filling in the holes is most important in planting the tree. To get the best results, moist soil must be placed closely around the roots, preferably by hand, so that no air holes or crevices are left.

When the trees are placed in position, the roots are spread out and a shovelful or two of fine earth thrown in upon them. The soil should be carefully worked in between the crevices and, when the hole is about one-third full, the soil about the roots of the tree should be tramped down firmly. Moving the tree up and down, while the earth is being filled in, will assist materially in eliminating air holes and in bringing the soil into close contact with the roots. There is little danger of the earth being over-packed, but trees often die for lack of tramping.

After the roots are all covered and packed in tightly, the hole may be filled in with loose soil. Tramping the top of the ground after completely filling the hole is undesirable.

When planting the tree allowance must be made for the looseness of the ground in deciduous fruit areas in the Stanthorpe district. If the tree is set only as deep as the collar, it will be well out of the ground twelve months later, when the land has settled down. Hence, to ensure

the best results, the collar of the young tree should be from 4 to 6 inches below the surface of the ground. In twelve months' time, the collar will be at the proper depth—namely, level with or just under ground level.

If possible, trees should be planted not later than the end of July. The root system will then be established before the buds start to shoot. Later planting is apt to be too great a tax on the tree's resources.

Since the roots have been cut back prior to planting, it is necessary to cut back the top of the tree proportionately in order to maintain a balance between the top and the root. If this is not done, the tree, when it comes into leaf, will lose moisture faster than the reduced root system can supply it, and death may result.

A tree should be headed low—the best height being 18 inches to 2 feet. The most uniform orchards are made by setting whipsticks in preference to headed trees. With whipsticks, the grower can form any desired type of head, whereas trees headed in the nursery often possess badly formed heads which have to be cut off and re-formed in the orchard.

Three, or at most, four main limbs at the start are enough for any fruit tree. If properly placed on the trunk, it will never be necessary to cut out a large limb, a practice which is undesirable except in the most extreme cases.

The main limbs should not all start at the same height from the trunk, for if all the weight of limbs and of fruit is directed at a single point, the tree is liable to split. Opposite crotches should be avoided.

The after cultivation of freshly-planted trees, as well as all other trees, is most important. It is a loss of both time and money to plant trees unless the orchardist is prepared to look after them. Young trees left to struggle against weeds, drought, and a poverty-striken soil suffer severely. If, by chance, they do survive, they become stunted, and are never of much value. Great care is necessary in cultivating an orchard, for the careless use of horses and implements can do very great harm to the trees.

CULTIVATING NEW BANANA LAND.

The benefit to be derived from a thorough breaking-up of the soil in new land should not be overlooked, especially as so much forest country is now being used for banana-growing. If possible, breaking-up should be done before planting, but, with new land, time may not permit of this being done between burning-off and planting. Therefore, growers are advised to do this work during the first winter at the very latest, otherwise much damage may be done to the rooting system of the banana plants. Mattocks or fork hoes are the implements best suited for this work.

The land should be dug up to a depth of not less than 8 inches. A great improvement in the physical and mechanical condition of the soil will be observed soon afterwards. Increased root development, making possible the drawing of plant food from a much greater area, will result in vigorous plant growth and the production of larger bunches and fruit of higher grade.

On many farms, small crops, such as peas and beans, are planted between the rows of young bananas, and the thorough breaking-up of the

soil will also benefit these crops, inducing quicker growth and greater bearing capacity.

The need of improving the humus content of the soil, particularly our forest soils, should be recognised. Humus can be added to the soil by burying the pea and bean plants after the pods have been picked. Shallow trenches should be dug across the slope of the land at convenient intervals, and the crop residues buried in the trenches under a covering of at least 2 inches of soil. The formation of these trenches across the slopes assists in preventing surface soil erosion.

Legumes such as beans and peas extract nitrogen from the air, and some of this nitrogen is returned to the soil in a readily available form when the roots and vines of these plants are turned under. The soil is thus enriched with this valuable plant-food. In addition, the humus content, fertility, and moisture-retaining capacity—a very important factor in successful banana-growing—of the soil is increased or, at least, maintained.

Where the soil has been well dug, less chipping is required, because the rapid growth of the banana plant soon controls weed growth; besides, mechanical condition of the soil is improved, making chipping easier and thus reducing cultivation and production costs.

—*J. M. Wills.*

RED SPIDER ON PAPAWS.

The red spider is a mite known to attack a variety of hosts. The name is rather misleading, for the colour is seldom red, greyish-green being dominant, although the actual shade varies greatly even within a single colony.

The foliage of affected papaw plants shows symptoms comparable with dry weather effects. The leaf margins curl, the upper surface of the leaves turns yellowish, particularly near the main veins, and the corresponding under surface is a darker green than normal. Reddish-brown blotches may appear in the final stages of an attack. Normally, infestation commences in the older leaves, and then spreads to the younger growth. These symptoms are the result of mass feeding by very large numbers of mites on the under surface of the leaves. The fruit may also be infested, but this type of injury is of slight importance compared with the impoverishment associated with extensive leaf injury.

When infested leaves are closely examined, all stages of the mite from the microscopic egg to the very minute adult can be observed on the under surface. Silken threads are spun by the adult and illustrate a characteristic habit of this and some related species, from which they have acquired the name "spinning mites."

Growth is very rapid, particularly in summer, when the period between egg and adult is approximately only a fortnight. Because of its high reproductive rate, an attack may develop very quickly. Red spider outbreaks are, however, usually sporadic, acute one month and negligible the next, but a whole season's growth may nevertheless be disturbed by a single attack.

Although predators are frequently active on red spider infested plants, they cannot be relied upon to keep the pest in check, and control measures are often necessary. Fortunately, the red spider is by no means difficult to control, and either a lime sulphur spray or a sulphur

dust can be used. Lime sulphur is, perhaps, the more effective, and as the spray gives good control of powdery mildew this treatment is frequently preferred. Although a lime sulphur spray can be used at a concentration of 1 in 35 during winter and early spring, weaker solutions will be necessary in warmer weather if injury to the plant is to be avoided. For large-scale work, particularly in hilly country, the sulphur dust is more easily applied, and where mite control is the main objective, reasonably good results are achieved. No matter which treatment be adopted, thoroughness in application is essential and particular attention should be paid to the under surface of the leaves, where the pest is more numerous. If the mites are plentiful, some may survive a single spray or dust application. More than one treatment may then be necessary to give adequate control.

—*J. Harold Smith.*

PRUNING DECIDUOUS FRUIT TREES.

The pruning of deciduous fruit trees has commenced, and this very important work should be done as well as it is possible for the operator to do it.

To make a good job of pruning, good, clean, sharp tools are very necessary. Pruners will find it useful to provide themselves with a light box—fitted with a strap to make carrying easy—for holding secateurs, pruning saw, sharp pruning knife, oil-stone, oil-can, pot of coal tar, a brush and a bottle of disinfectant.

A good pair of secateurs is essential and they must be kept sharp and smooth. Every pruning cut causes a wound, but wounds of small diameter soon callus over provided the secateurs are sharp and clean. Many pruners try to cut with their secateurs some of the larger limbs, and thus strain both the secateurs and their own wrists, while generally hacking the limb off and leaving rough edges which harbour pests, and facilitate the entry of fungous diseases. All large cuts should, therefore, be made with a saw which, like the secateurs, should be both sharp and clean.

A sharp pruning knife is necessary for trimming the rough edges left by the saw, for, if they are not pared, callus formation is slow and the wound may not heal.

The need for an oilstone and oil is obvious. A rub of the secateur blades on the oil-stone now and again keeps them keen and sharp, and makes the work much easier.

Pruners should always have with them a pot of coal tar, for tar is a disinfectant as well as a wood preservative, and being pliable, makes a good surface covering. After pruning one tree and before going on to the next it is advantageous to paint all large cuts over with coal tar. The operation takes only a couple of minutes, and will help the tree considerably.

Both secateurs and saw often require disinfecting, for many diseases can be transferred from tree to tree by these implements. A strong solution of either formalin or corrosive sublimate rubbed over the blade with a rag will reduce any risk.

The foregoing suggestions are valuable, as fruit trees on which a man depends for his living and which he expects to keep him for many years deserve the best treatment possible in regard to pruning as well as to cultivation and manuring.

—*R. L. Prest.*

TALL-GROWING VARIETIES OF BANANAS.

At present, the standard commercial banana is the Cavendish, of relatively low-growing form.

Although some of the tall-growing types—such as the Gros Michel, Williams' Hybrid, Vernon, and Mons Marie—have been in cultivation in small areas for a long period, the demand for suckers of these varieties has only recently become of any consequence. In certain favoured localities, they may yet become as popular as the shorter-growing Cavendish.

The fruit of some tall-growing varieties compares favourably with the Cavendish in both size and quality, while their carrying capacity is frequently superior.

Under ordinary conditions, cultural methods applicable to the Cavendish banana can be used for tall varieties. They respond to approved desuckering systems used for the Cavendish and, generally speaking, yield a greater weight of fruit per acre. The returns per acre from tall varieties are thus sometimes better than those received from the more widely grown Cavendish.

WINTER ACTIVITIES IN THE ORCHARD.

Clean up all orchards and vineyards, destroy all weeds and rubbish around the trees likely to harbour pests of any kind, and keep the surface of the soil well stirred, so as to give the birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Pruning can be started on fruit trees which have shed their leaves towards the end of the month, as it is a good plan to get this through as early in the season as possible instead of putting off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—not vines. (The later vines are pruned in the season the better in the Granite Belt District, as the late-pruned vines stand a better chance of escaping injury by late spring frosts.) All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out and burnt, as they are both valueless and a harbour for pests.

Land intended for new orchards should be got ready at once. The preparation of the land should be thorough. All stumps and roots should be removed to a depth sufficient to ensure their not impeding cultivation by coming in contact with implements The preliminary cultivation should consist of a light ploughing of a depth sufficient to turn the weeds or grasses so that their roots are exposed, followed by cross ploughing and harrowing, whereby light roots, &c., are collected and removed. When perennial weeds, of which couch grass is a fair sample, are eliminated, the land should be ploughed and cross ploughed as deeply as possible, and the soil reduced to a fine tilth. Where subsoiling can be practised, it is a decided advantage in admitting root penetration and conservation of moisture.

PREPARING LAND FOR SPRING PLANTING OF PINEAPPLES.

The early preparation of land for the spring planting of pineapples is desirable, and areas to be planted should be ploughed now, as deeply as the implements available and the depth of the surface soil will permit. If possible, this ploughing should be followed by at least one subsoiling. On no account should the subsoil be brought to the surface. The land should be left in the rough for some time; and, later, ploughed and cultivated to an even tilth. It will then be in good condition for planting at a favourable opportunity in the spring. It should be borne in mind that a stand of pineapples remains in the ground for several years, and, consequently, deep cultivation should be done before planting.

Adequate preparation, as suggested, improves both the aeration and moisture-holding capacity of the soil and thus enables root growth to develop under the most favourable conditions. This is most important, since the first few months of the life of a pineapple plantation largely determine its productivity. Furthermore, as has been amply demonstrated, vigorously growing plants are highly resistant to disease.

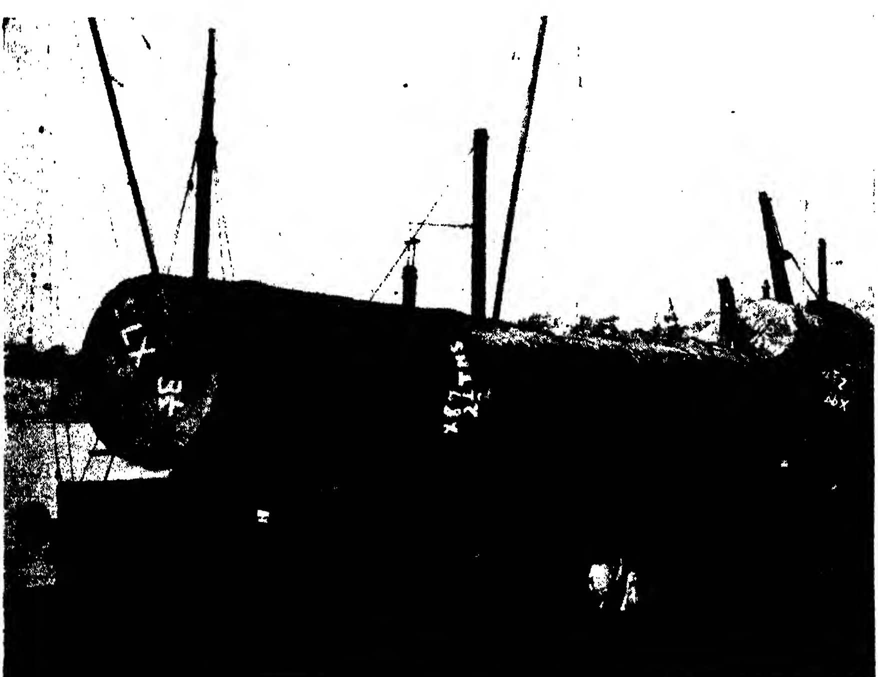


Plate 37.
Mill logs at the waterside at Brisbane awaiting shipment.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

JUNE was remarkable for some of the coldest weather experienced in Southern Queensland for a long time. This has had a very adverse effect on the fruit prices, particularly for citrus fruits. This year an exceptionally large crop of custard apples also affected the citrus fruit demand. Prevailing prices during the last week of June:—

Bananas.

Brisbane.—Cavendish: Sixes, 5s. to 11s. 6d.; Sevens, 7s. 6d. to 13s. 6d.; eights and nines, 10s. 6d. to 14s. 6d.; per dozen 1¼ to 5d.

Melbourne.—Cavendish: Sixes, 11s. to 13s.; sevens, 13s. to 15s.; eights and nines, 15s. to 17s.

Sydney.—Cavendish: Sixes, 10s. to 14s.; sevens, 14s. to 16s.; eights and nines, 16s. to 19s.

Brisbane.—Lady Fingers, 2d. to 6d.

Brisbane.—Sugars, 1½d. to 2½d.

Growers will have to exercise care in the selection of well-filled fruit before packing.

Pineapples.

Brisbane.—Smoothleaf, 4s. to 6s. per case, 1s. to 5s. per dozen; Roughs, 4s. to 5s. 6d. per case.

Sydney.—Smoothleaf, 7s. to 10s. per case.

Melbourne.—Smoothleaf, 6s. to 10s. per case.

Water blister has, during the last few weeks, been prevalent. The time has come when, to avoid heavy loss, growers will have to take all precautions such as packing-shed hygiene, careful handling, and packing. Periods of heavy affection by water blister tend to make buyers lose confidence in the fruit, causing reduced sales and prices.

Custard Apples.

Brisbane.—2s. 6d. to 4s. 6d. per half-bushel case.

Sydney.—4s. to 7s. per half-bushel case.

Melbourne.—4s. to 6s. per half-bushel case.

Supplies have lessened and the prices of this fruit should remain firm.

Passion Fruit.

Brisbane.—First grade, 7s. to 8s.; seconds, 4s. to 6s.

Sydney.—First grade, 4s. to 10s.

Melbourne.—First grade, 10s. to 12s.

Papaws.

Brisbane.—Yarwun, 4s. to 7s. per tropical case; Gunalda, 4s. to 5s. per bushel case; Locals, 2s. to 3s. 6d. per bushel case.

Sydney.—Yarwun, 7s. to 11s. per tropical case.

Melbourne.—Yarwun, 8s. to 12s. per tropical case.

Too many green papaws are being supplied to all markets. Under winter conditions the fruit should be allowed to ripen to show half colour.

Strawberries.

Brisbane.—5s. to 9s. per dozen boxes; Specials, to 14s.

Sydney.—Trays, 4s. to 6s.; Boxes, 12s. to 15s.

Care should be exercised to exclude all berries showing the effects of the weather.

CITRUS FRUITS.

Oranges.

Brisbane.—Navels, 4s. to 7s.; commons, 3s. to 5s.

Mandarins.

Brisbane.—Gayndah Glens, 6s. to 10s. per bushel case; Scarlets, 2s. 6d. to 6s., a few special higher; Emperor, 2s. 6d. to 6s.

Grape Fruit.

Brisbane.—Locals, 4s. to 7s. per bushel case; Gayndah, 11s. to 13s. per bushel case.

Lemons.

Brisbane.—Gayndah, 7s. to 12s. per bushel case; Locals, 4s. to 6s. per bushel case.

Cold weather is having a very adverse effect on prices. Growers are well advised to send regular small consignments instead of large irregular ones.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Stanthorpe (Granny Smith), 7s. to 10s. 6d. per bushel case.

Brisbane.—Southern Apples, Jonathan, 7s. to 11s.; Cleo, 7s. to 8s. 6d.; Scarlets, 6s. to 8s.; Sturmer, 5s. to 7s.; other varieties to 7s. 6d.

Many lines of apples, obviously not out of cold stores, are showing signs of sleepiness, making sales hard.

Quinces.

Brisbane.—7s. to 8s. per bushel case.

Pears.

Brisbane.—Winter Cole, 10s. to 13s.; Josephine, 7s. to 12s.; Beurre Bose, 6s. to 8s.; Packhams, 7s. to 9s.; W. Nietis, 6s. to 11s.

OTHER FRUITS.

Gooseberries.

Brisbane.—6d. per lb.

Rosellas.

Brisbane.—Rosellas, 2s. 6d. to 3s. per sugar bag.

Tomatoes.

Brisbane.—Ripe, 6s. to 9s. per half-bushel case; Green, 3s. to 6s. 6d. per half-bushel case; Coloured, 6s. to 10s., a few specials higher.

Sydney.—Queensland, 6s. to 8s. per half-bushel case.

VEGETABLES.

Cauliflowers.—Small, 1s. to 3s. dozen; large, 5s. to 8s. dozen.

Cabbages.—Small, 2s. to 4s. dozen; large, 5s. to 7s. 6d. dozen.

Chokos.—6d. to 1s. 3d. dozen.

Marrows.—3s. to 4s. per case.

Cucumbers.—6s. to 7s. per case.

Beans.—6s. to 10s. sugar bag.

Peas.—5s. to 10s. sugar bag.

Lettuce.—9d. to 2s. per dozen.

PARSNIP-GROWING.

Although the parsnip is a native of England, and must therefore be classed as a temperate climate vegetable, it may be grown with reasonable success in the tropics during the winter season.

Soil for growing this vegetable should be deep, rich, and free. A good sandy loam gives excellent results. The soil should be prepared some months previously by trenching or cultivating deeply and incorporating a heavy dressing of stable manure. Organic manures should never be applied in considerable quantities immediately before planting this crop, as they frequently induce forking of the roots. At the end of the wet season the ground should be thoroughly worked up and reduced to a very fine tilth. The seed is then sown thinly and very lightly raked over, after which the soil should be rolled or well packed down with the back of a spade along the drills. The packing is necessary to ensure close contact between the seeds and the soil. A light covering of old horse manure well crumbled or old sawdust will assist germination by preventing the caking of the surface soil.

As soon as the seedlings are well up, thin them out where they are overcrowded, and when about 4 to 6 inches high thin out finally to about 8 inches apart.

Parsnip seed is usually of rather poor germinating capacity, and is practically useless unless quite fresh.

—*S. E. Stephens.*

Stock Licks and Mineral Feeds Registered for 1938.

F. B. COLEMAN, Officer in Charge Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

IT is required by the provisions of the "Stock Foods Acts" that every stock lick and mineral feed that is being offered for sale within the State of Queensland shall be registered annually during the month of January.

The objective of that portion of the "Stock Foods Acts" relative to this subject is to ensure that the buyer shall receive attached to each package of stock lick or mineral feed a label setting out in uniform terms the Acts' requirements—the materials being subject to check analysis by the Department of Agriculture and Stock to ensure that the guarantees are lived up to.

A list of the various preparations that have been registered up to the date of publication, is attached. This sets out the name of the preparation, the maximum percentage of salt and the minimum percentages of phosphoric acid (P_2O_5), Lime (CaO), Magnesia (MgO), Iron (Fe), Sulphur (S). Where these are present in more than one form the respective minimum percentage of each form is shown. The proportion of iodine present is declared in terms of ounces of potassium iodide per ton. The maximum percentage of any meal and percentage of molasses are shown—also the names of any other materials that may be present, and the name and address of the Queensland wholesale seller.

It will be observed that the method of labelling licks and mineral feeds includes the stating of the percentages of the various chemical constituents contained in the ingredients used therein—the percentage of the actual material used is not shown except in the case of meals, molasses and salt. For instance, with bone, bone char, dicalcium phosphate, Nauru phosphate and superphosphate the percentages of phosphoric acid and lime are shown; with magnesium sulphate (Epsom salts) the percentage of magnesia; and with iron sulphate and limonite the percentage of iron.

In other words as sterilised bone is supplied to animals for its phosphoric acid and lime content, the percentages of these constituents are declared on the label.

At present there are some licks upon the market, upon whose labels the percentage of lime—contained in the phosphoric acid carrying materials has not been shown; also there are some labels that show the proportion of magnesium sulphate and iron sulphate instead of the percentage of magnesium and iron. In such cases the figures quoted in the table have been calculated and inserted in terms of lime (CaO), magnesia (MgO), and iron (Fe).

These labels are in the transition stage and as they are reprinted will be brought into line.

When a lick or mineral feed contains over 50 per cent. of food materials the percentages of crude protein, crude fat, and crude fibre are shown.

In the table it will be found that the block licks have been grouped together at the end.

Purchasers would be well advised to never accept delivery of any licks or mineral feeds to which the necessary labels are not attached.

In the event of any complaints they should *at once* communicate with the Department in order that the necessary investigation may be undertaken.

STOCK LICKS AND MINERAL FEEDS.

PURPORTING TO COMPLY WITH SECTION 3 OF "THE STOCK FOODS ACTS" FOR THE YEAR 1938—COMPILED TO 15TH JUNE, 1938.

Sold under Name of—	Sellers Guarantee. Phosphoric Acid (P_2O_5.)	Lime (CaO)	In the Form of—	Maximum Salt.	Magnesia (MgO)	Iron (Fe)	Sulphur (S)	Potassium Iodide Oz. to ton	Other Ingredients (Maximum).		Queensland Wholesale Seller.
	%	%		%	%	%	%			%	
"Acco" Salt Lick ..	6·2	8·9	Sterilised bone meal	60·0	0·1	*0·2	4·8	33½	Molasses	2·5	Australian Chemical Co. Ltd., Brisbane
	..	5·0	Calcium carbonate						Sodium bicarbonate ..	..	
Aminac Concentrated Sheep Lick	15·0	20·8	Sterilised bone meal	..	..	..	..	..	Flavouring matter ..	..	J. Kitchen and Sons Pty. Ltd., Brisbane
	8·0	8·0	Di-calcium phosphate								
"Austral" Medicated Pig Lick	12·0	14·5	Sterilised bone flour	16·0	..	..	..	16	Meat meal	5·5	Taylors Elliotts Veterinary Co., Brisbane
	..	15·9	Carbonate of lime								
"Austral" Medicated Stock Lick	3·0	3·0	Di-calcic phosphate	39·0	0·7	*0·3	1·7	1½	Cotton seed meal ..	8·6	Taylors Elliotts and Australian Drug Pty. Ltd., Brisbane
	13·0	17·0	Nauru phosphate								
"Austral" Medicated Stock Lick (with Molasses)	2·7	2·1	Di-calcic phosphate	33·0	0·6	*0·3	1·7	1½	Cotton seed meal ..	8·0	Taylors Elliotts Veterinary Co., Brisbane
	11·2	13·3	Nauru phosphate						Molasses	18·0	
Blue Cross Di-calcic Concentrated Stock Lick	18·5	26·9	Sterilised bone flour	..	..	†1·5	..	..	..		Dalgety and Co. Ltd., Brisbane
	7·4	6·8	Di-calcic phosphate								
	5·6	7·8	Nauru rock phosphate								
Bone and Salt Lick	15·0	18·0	Sterilised bone meal ..	36·0	..	..	..	..	..		Central Queensland Meat Export Co. Ltd., Rockhampton
Borthwicks Bomo Poultry Tonic	14·0	16·0	Sterilised bone meal	36·0	0·2	*0·2	2·8	30	..		Thos. Borthwick and Sons (Aust.) Ltd., Brisbane
	..	5·3	Calcium carbonate								
Borthwicks Iodised Poultry Tonic	12·0	16·0	Sterilised bone meal	35·0	0·3	*0·2	3·0	30	..		Thos. Borthwick and Sons (Aust.) Ltd., Brisbane
	..	7·0	Hydrated lime..								
Borthwicks T.B. and S. Moreton Bonolik for Stock	12·0	16·0	Sterilised bone meal ..	46·0	0·2	*0·2	2·8	30	..		Thos. Borthwick and Sons (Aust.) Ltd., Brisbane
Borthwicks T.B. and S. Moreton Salbolik	8·0	11·0	Sterilised bone meal ..	66·0	..	..	..	..	..		Thos. Borthwick and Sons (Aust.) Ltd., Brisbane
Chic-A-Vite	2·7	3·6	Bone flour ..	..	1·4	*1·8	1·8	12	Meal from rice	16·5	Webster Bros. Pty. Ltd., Brisbane
	18·0	24·0	Bone char ..						Cod liver oil	2·0	
Dalco Stock Lick 1 ..	13·0	17·5	Rock phosphate	35·0	0·6	*0·5	2·5	16	Molasses	5·0	Dalgety and Co. Ltd., Brisbane
	3·5	4·6	Sterilised bone meal								
Darling Downs Iodised Phosphate Lick	1·5	2·0	Sterilised bone meal	78·0	..	..	..	3	Pollard	12·5	Darling Downs Stock Feed Factory, Mackay
	2·5	3·0	Nauru phosphate								
"Emu" Medicated Pig Lick	12·0	14·5	Sterilised bone flour	16·0	..	..	..	..	Meat meal	5·5	Campbell Bros. Pty., Ltd., Brisbane
	..	15·9	Carbonate of lime°								
"Emu" Medicated Stock Lick	3·2	2·5	Di-calcic phosphate	39·0	0·8	*0·3	1·7	1½	Cotton seed meal ..	9·5	Campbell Bros. Pty. Ltd., Brisbane
	13·0	15·5	Nauru phosphate								
"Emu" Medicated Stock Lick (with Molasses)	2·5	2·0	Di-calcic phosphate	34·0	0·7	*0·20	1·4	1½	Cotton seed meal ..	7·5	Campbell Bros. Pty. Ltd., Brisbane
	11·0	13·2	Nauru phosphate						Molasses	17·0	
Eucalick Medicated Sheep Lick	4·0	5·0	Bone char	78·0	..	..	1·0	..	Molasses	5·0	McGlew and Co., Brisbane
									Fish oil	..	
									Eucalyptus oil	..	

F.D.L. Nutro-Lik	12·5 ..	15·0 12·5	Bone Lime carbonate	24·0	..	*0·30	..	..	Glaubers salt	..	Fertilisers Distributers Pty. Ltd., Brisbane
G.B.A. Lick No. 1	3·4	4·1	Bone char	70·0	..	*0·15	0·7	..	Molasses Cod oil Eucalyptus oil	5·0	Graziers Benefit Association, Brisbane
G.B.A. Lick No. 2	3·5	4·2	Bone char	71·0	..	*0·16	0·8	..	Molasses Char coal	5·0 ..	Graziers Benefit Association, Brisbane
G.B.A. Lick No. 3	4·0	4·8	Bone char	81·0	..	*0·18	0·9	..	Molasses	5·0	Graziers Benefit Association, Brisbane
G.B.A. Lick No. 4	4·0	4·8	Bone char	80·0	..	..	0·8	..	Molasses Cod oil Eucalyptus oil	5·0	Graziers Benefit Association, Brisbane
Gilmour's Poultry Powder	1·6 5·7 ..	2·2 6·8 8·5	Sterilised bone meal Nauru phosphate Shell grit	12·0	1·4	*0·4	2·0	..	Meal from meat Linseed and wheat germ Charcoal, cayenne, quassia, ginger, fenugreek	.. 16·0 	J. F. Finn, Brisbane
Hibiscus National Stock Lick	14·5	19·6	Nauru phosphate	40·0	0·8	*0·8	2·0	..	Molasses	6·0	Queensland Pastoral Supplies Ltd., Brisbane
Hibiscus Special Bone Meal Lick	8·2	10·0	Sterilised bone flour	50·0	0·9	*0·5	2·8	..	Molasses	8·0	Queensland Pastoral Supplies Ltd., Brisbane
Hibiscus Special Ewe Lick	8·0	10·6	Bone meal	30·0	0·7	*0·4	5·0	..	Molasses Cotton seed meal	8·0 25·0	Queensland Pastoral Supplies Ltd., Brisbane
D. Iodolik Mineral Supplement for Cattle	0·4 16·5	0·7 19·0	Sterilised bone Nauru phosphate	34·0	0·6	*0·2	1·2	20	Peanut meal	11·0	Denhams Pty. Ltd., Brisbane
D. Iodolik Mineral Supplement for Pigs	11·1 1·2 ..	13·2 1·5 5·0	Nauru phosphate Sterilised bone Calcium carbonate	16·0	0·3	*0·2	4·9	20	Meat meal Bicarbonate of soda Charcoal Glaubers salt	11·0	Denhams Pty. Ltd., Brisbane
Kwik-Lik	8·0 6·0	10·8 7·9	Rock phosphate Sterilised bone meal	45·0	0·3	*0·4	2·0	..	..		A.C.F. and Shirleys Fertilizers Ltd., Brisbane
"Lix-All" Vitality Stock Lick	11·0	13·0	Bone char	53·0	0·2	*0·3	1·8	2	Molasses Wheat by-product	5·0 5·0	Queensland Primary Producers Co-operative Association Ltd., Brisbane
Mactaggarts No. 1 Concentrated Lick	7·5 4·5 4·0	9·0 5·5 3·0	Bone flour Bone charcoal Di-calcic phosphate	..	..	*1·0	5·0	..	Cotton seed meal Soda bicarbonate	30·0 5·0	Mactaggarts Primary Producers Co-operative Association Ltd., Brisbane
Mactaggarts No. 2 Lick Dry Time and Ewe Lick	12·5	15·0	Bone flour	37·0	..	..	..	..	Cotton seed meal Molasses	10·0 5·0	Mactaggarts Primary Producers Co-operative Association Ltd., Brisbane
Mactaggarts No. 3 Medicated Tonic Lick	4·5	5·5	Bone char	75·0	0·3	*0·2	2·0	..	Molasses Dugong and cod oils Eucalyptus and flavouring matter	3·0 .. 	Mactaggarts Primary Producers Co-operative Association Ltd., Brisbane
Osmonds "Concentrated" Lick for Cattle	9·0 ..	12·0 6·6	Sterilised bone meal Calcium carbonate	..	1·3	*0·4	2·2	15	Peanut, linseed, pea, rice, and locust bean Bicarbonate of soda, fenugreek, caraway, cod liver oil, liquorice and colouring matter	31·0 	Flynn Bros., Brisbane
Osmonds "Toneca" Stock Lick	6·0 ..	7·9 2·5	Sterilised bone meal Calcium carbonate	75·0	0·1	*0·2	2·5	14	..		Flynn Bros., Brisbane

* Iron as sulphate. † Iron as limonite.

Except with respect to Salt, Meals, and Molasses, all percentages declared are minima.

STOCK LICKS AND MINERAL FEEDS—*continued.*

PURPORTING TO COMPLY WITH SECTION 3 OF "THE STOCK FOODS ACTS" FOR THE YEAR 1938—COMPILED TO 15TH JUNE, 1938.

Sold under Name of—	Sellers Guarantee.										Queensland Wholesale Seller.
	Phosphoric Acid (P_2O_5)	Lime (CaO)	In the Form of—	Maximum Salt.	Magnesia (MgO)	Iron (Fe)	Sulphur (S)	Potassium Iodide Oz. to Ton	Other Ingredients (Maximum).		
	%	%		%	%	%	%			%	
Our Salt Lick for Dairy Herds	3·0 6·5 ..	3·6 7·8 2·0	Sterilised bone meal Nauru phosphate Burnt lime ..	58·0	0·7	*0·4	1·3	16	Saltpetre	..	Atherton Tableland Co-operative Butter Association Ltd., Atherton
Pegalick (Concentrated) ..	14·4	19·2	Bone meal	35·6	..	*0·2	4·7	19	Cupric sulphate .. .. Molasses	.. 4·4	Bryce Ltd., Brisbane
Por-Co-Vite	6·0 13·2 ..	8·0 10·7 5·6	Bone flour .. Bone char .. Calcium carbonate	12·8	0·83	*0·3	10·0	24	Cod liver oil	3·0	Webster Bros. Pty. Ltd., Brisbane
Prophylactic Blue Cross Stock Lick	..	0·28	Calcium sulphate ..	86·0	0·4	*0·4	2·6	..	Molasses .. .. Soda carbonate ..	4·0 ..	Dalgety and Co. Ltd., Brisbane
"Red Comb" Minlik	13·8	16·5	Sterilised bone flour ..	..	3·4	*3·1	5·2	48	..		Poultry Farmers Co-operative Society Ltd., Brisbane
"Red Comb" Iodised Stock Lick	1·2	1·5	Sterilised bone flour ..	95·0	0·3	*0·3	0·5	4·4	..		Poultry Farmers Co-operative Society Ltd., Brisbane
"United" Lick No. 1	15·0	18·0	Bone flour	38·0	..	..	..	..	Molasses	5·0	United Chemical Co. Pty. Ltd., Brisbane
"United" Lick No. 2	12·5	15·0	Bone flour	36·0	..	..	..	..	Cotton seed meal .. Molasses	10·0 5·0	United Chemical Co. Pty. Ltd., Brisbane
Vic-Lic Concentrated Cattle Lick	11·2 16·8	11·2 21·0	Di-calcic phosphate Bone char ..	5·0	..	†2·45	..	16	Rice meal..	16·0	Wilcox Mofflin Ltd., Brisbane
Vic-Lic Concentrated Sheep Lick "D"	11·2 16·8	11·2 21·0	Di-calcic phosphate Bone char ..	..	..	†2·45	..	16	Sodium sulphate .. Rice meal	.. 18·0	Wilcox Mofflin Ltd., Brisbane
Vic-Lic Concentrated Sheep Lick "G"	11·2 16·8	11·2 21·0	Di-calcic phosphate Bone char ..	..	..	†4·9	..	16	Rice meal..	18·0	Wilcox Mofflin Ltd., Brisbane
Vic-Lic Mixed Sheep Lick "D"	2·2 3·3	2·2 4·1	Di-calcic phosphate Bone char ..	75·0	..	†0·49	..	3	Sodium sulphate .. Rice meal .. .. Molasses	.. 4·0 5·5	Wilcox Mofflin Ltd., Brisbane
Vic-Lic Mixed Sheep Lick "G"	2·2 3·3	2·2 4·1	Di-calcic phosphate Bone char ..	75·0	..	†0·98	..	3	Rice Meal .. .. Molasses	4·0 5·5	Wilcox Mofflin Ltd., Brisbane
Vita-Lick Cattle Lick Concentrated "D"	4·1 11·2 0·47	5·5 15·0 0·5	Bone flour .. Bone char .. Meat meal ..	..	1·33	*0·9	2·1	16	Meal from rice .. .. Meal from cocoa .. Meat meal	27·2 7·8 3·6	Webster Bros. Pty. Ltd., Brisbane
Vita-Lick Cattle Lick Concentrated "G"	2·5 17·5 0·55	3·3 23·4 0·6	Bone flour .. Bone char .. Meat meal ..	..	1·33	*1·8	2·1	16	Meal from rice .. .. Meal from cocoa .. Meat meal	5·3 10·6 4·5	Webster Bros. Pty. Ltd., Brisbane

Vita-Lick Cattle Lick Mixed "D"	0·75	1·0	Bone flour ..	74·0	0·24	*0·17	0·39	3	Molasses	5·2	Webster Bros. Pty. Ltd., Brisbane
	2·0	2·7	Bone char ..						Meal from rice	5·0	
	0·09	0·1	Meat meal ..						Meal from cocoa ..	1·4	
									Meat meal	0·7	
Vita-Lick Cattle Lick Mixed "G"	0·46	0·61	Bone flour ..	74·0	0·24	*0·35	0·39	3	Molasses	5·3	Webster Bros. Pty. Ltd., Brisbane
	3·2	4·3	Bone char ..						Meal from rice	1·0	
	0·1	0·1	Meat meal ..						Meal from cocoa ..	2·0	
									Meat meal	0·8	
Vita-Lick Concentrated "D"	4·2	5·6	Bone flour ..	..	1·3	*1·7	8·0	16	Meal from rice	26·0	Webster Bros. Pty. Ltd., Brisbane
	8·8	11·7	Bone char ..						Meal from cocoa ..	10·0	
Vita-Lick Concentrated "G"	2·5	3·3	Bone flour ..	..	1·3	*1·7	8·0	16	Meal from rice	4·4	Webster Bros. Pty. Ltd., Brisbane
	17·0	22·6	Bone char ..						Meal from cocoa ..	10·8	
Vita-Lick Extra Strength Mixed "D"	1·3	1·75	Bone flour ..	62·0	0·4	*0·55	2·5	5	Molasses	4·7	Webster Bros. Pty. Ltd., Brisbane
	2·7	3·6	Bone charcoal						Meal from rice	8·0	
									Meal from cocoa ..	3·1	
Vita-Lick Extra Strength Mixed "G"	0·8	1·1	Bone flour ..	62·0	0·4	*0·55	2·5	5	Molasses	1·4	Webster Bros. Pty. Ltd., Brisbane
	5·3	7·0	Bone char ..						Meal from rice	3·4	
									Meal from cocoa ..	2·2	
Vita-Lick Mixed "D" ..	0·8	1·1	Bone flour ..	75·0	0·25	*0·33	1·5	3	Molasses	4·0	Webster Bros. Pty. Ltd., Brisbane
	1·6	2·1	Bone char ..						Meal from rice	5·0	
									Meal from cocoa ..	2·0	
Vita-Lick Mixed "G" ..	0·47	0·63	Bone flour ..	75·0	0·25	*0·33	1·5	3	Molasses	3·5	Webster Bros. Pty. Ltd., Brisbane
	3·2	4·3	Bone char ..						Meal from rice	0·85	
									Meal from cocoa ..	2·0	
V.M.M. Vita-Lick Mineral Mixture	1·4	1·9	Bone flour ..	4·5	0·53	*0·45	1·2	..	Meal from rice	50·0	Webster Bros. Pty. Ltd., Brisbane
	8·0	10·7	Bone char ..			‡0·15			By-product of cocoanut	8·8	
									Min. crude protein ..	7·5	
									Min. crude fat	7·8	
									Max. crude fibre ..	3·1	
Wagstaffs Medicated Stock Salt	3·1	3·1	Di-calcic phosphate	62·0	..	*1·5	1·5	20	Molasses	5·2	Australian Disinfectant Co., Brisbane
	1·6	2·2	Sterilised bone meal						Bicarbonate of soda ..	..	
	3·5	4·7	Nauru phosphate						Bitter aloes	..	
									Oil of aniseed	..	
									Bran	5·0	
Wagstaffs Medicated Stock Salt (New Formula)	3·4	4·1	Sterilised bone meal	41·0	..	*0·3	1·5	20	Cotton seed meal ..	10·5	Australian Disinfectant Co., Brisbane
	4·0	4·5	Nauru phosphate						Bran	5·0	
	2·8	2·2	Di-calcic phosphate						Bicarbonate of soda ..	..	
	..	4·2	Limestone ..						Bitter aloes	..	
									Oil of aniseed	..	
Wagstaffs Medicated Stock Lick No. 3	5·0	6·6	Sterilised bone flour	53·0	..	*0·3	1·5	20	Bran	6·0	Australian Disinfectant Co., Brisbane
	3·7	5·0	Nauru phosphate						Molasses	6·0	
	..	2·5	Pulverised limestone								
Woolgro	13·0	14·0	Sterilised bone flour ..	..	..	..	..	..	Cotton seed meal ..	..	Queensland Pastoral Supplies Pty. Ltd., Brisbane
									Meat meal	..	
									Cobalt chloride ..	..	
									Min. crude protein ..	36·0	
									Min. crude fat	5·0	
									Max. crude fibre ..	5·0	

* Iron as sulphate. † Iron as limonite. ‡ Iron as oxide. Except with respect to Salt, Meals, Crude Fibre, and Molasses, all percentages declared are minima.

STOCK LICKS AND MINERAL FEEDS—*continued.*

PURPORTING TO COMPLY WITH SECTION 3 OF "THE STOCK FOODS ACTS" FOR THE YEAR 1938—COMPILED TO 15TH JUNE, 1938.

Sold under Name of—	Sellers Guarantee.									Queensland Wholesale Seller.
	Phosphoric Acid (P_2O_5)	Lime (CaO)	In the Form of—	Maximum Salt.	Magnesia (MgO)	Iron (Fe)	Sulphur (S)	Potassium Iodide Oz. to Ton	Other Ingredients (Maximum).	
	%	%		%	%	%	%	Oz.		
				BLOCKS.						
Carbofos Mineralised Block (Black)	2·4	3·2	Bone char ..	77·0	0·8	*0·1	..	..	Flavouring matter	Webster Bros. Pty. Ltd., Brisbane
	1·2	1·6	Superphosphate							
	0·7	0·95	Rock phosphate							
	..	2·0	Calcium hydrate							
Hibiscus Salt Block (Iodized) ..	..	..	..	99·0	..	..	..	7	..	Queensland Pastoral Supplies Pty. Ltd., Brisbane
Hibiscus Salt Block (Sulphurized)	..	..	..	97·0	..	..	1·5	..	..	Queensland Pastoral Supplies Pty. Ltd., Brisbane
"J.J." Salt Lick	..	..	..	100·0	..	..	..	..	..	J. Jackson and Co. (produce and Seeds) Pty. Ltd., Brisbane
Ram Stock Lick	..	..	..	100·0	..	..	..	..	..	T. McWilliam and Co. Ltd., Brisbane
Vita-Lick Mineralised Block (White)	1·4	1·9	Superphosphate	82·0	0·83	*0·1	..	..	Flavouring matter	Webster Bros. Pty. Ltd., Brisbane
	0·75	1·0	Rock phosphate							
	..	2·0	Calcium hydrate							
Vita-Lick Red Blocks ..	1·4	1·9	Superphosphate	82·0	0·83	*0·05	..	4	..	Webster Bros. Pty. Ltd., Brisbane
	0·75	1·0	Rock phosphate			‡0·5				
	..	2·0	Calcium hydrate							

* Iron as sulphate. † Iron as limonite. ‡ Iron as oxide.

Except with respect to Salt, Meals, and Molasses, all percentages declared are minima.

From the preceding table it will be observed that the chief sources of Phosphoric acid and Lime are Bone, Di-calcic phosphate and Nauru phosphate.

The following table sets out the guaranteed contents of these materials being offered for sale within Queensland.

Sold under Name of—	Minimum Phosphoric Acid P_2O_5.	Minimum Lime CaO.	Minimum Crude Protein.	Minimum Crude Fat.	Maximum Salt.	Queensland Wholesale Seller.
	%	%	%	%	%	
Bone (Sterilised)—						
A.C.F. Sterilised Bone Meal	24·0	31·5	13·0	..	..	A.C.F. and Shirleys Fertilizers Ltd., Brisbane
Calphos	25·0	30·0	20·0	..	..	Queensland Meat Industry Board, Brisbane
Hibiscus Sterilised Bone Flour	25·0	30·0	20·0	..	..	Queensland Pastoral Supplies Pty. Ltd., Brisbane
Sterilised Bone Meal	28·0	32·0	12·5	..	..	Central Queensland Meat Export Co. Ltd., Rockhampton
Tri-Cal-Os Sterilised Bone Flour	32·5	40·0	5·0	..	..	Glues and By-Products Pty. Ltd., Brisbane
Bone (Green)—						
Borthwicks Ground Green Bone for Poultry ..	19·0	27·0	30·0	3·0	..	Thomas Borthwick and Sons, Australia, Ltd., Brisbane
Di-Calcium Phosphate—						
Commonwealth Di-Calcic Phosphate	38·0	38·0	..	..	..	A.C.F. and Shirleys Fertilizers Ltd., Brisbane
Nauru Phosphate (Feeding)—						
Finely Ground Nauru Phosphate	37·0	43·0	..	..	..	Gibbs Bright and Co., Brisbane
Shirleys Finely Ground Nauru Phosphate Rock	37·0	43·0	..	..	..	A.C.F. and Shirleys Fertilizers Ltd., Brisbane
Meat and Bone Meals—						
Borthwicks Mebo Meal	8·0	9·6	52·0	10·0	..	Thomas Borthwick and Sons, Australia, Ltd., Brisbane
Excelsior Meat and Bone Meal	16·0	19·0	37·5	9·0	..	Denhams Pty. Ltd., Brisbane
Meat Meals—						
Hibiscus Phosfomeat	2·5	2·5	63·0	8·0	4·0	Queensland Pastoral Supplies Pty. Ltd., Brisbane
Protein Meal	..	..	62·0	8·0	4·0	Queensland Meat Industry Board, Brisbane
"Red Comb" Poultry Food No. 2	2·5	3·0	63·0	10·0	4·0	Poultry Farmers Co-operative Society Ltd., Brisbane
Sterilised Liver Meal	..	..	60·0	15·0	..	Central Queensland Meat Export Co. Ltd., Rockhampton

Farmers' Winter School.

THE students at the school of instruction in pig raising and dairying at the Queensland Agricultural College in June were an uncommonly keen group of practical farmers. But, as one of them remarked, there is always something more to be learned in these days of scientific farming methods. And so they had attended the annual school at Lawes to hear what the lecturer-experts of the College and the Department of Agriculture and Stock had to say on the theoretical side, to see what they had to show in practical demonstrations, to observe how some theories have worked out in practice at the College, and to decide for themselves just how much of what is new can be applied with profit in the working of their own farms and in the improvement of their own stock.

An interesting personality at the school was the Rev. Father E. A. Brill, chaplain and member of the staff of the Abergowrie Christian Brothers' Agricultural College near Ingham, North Queensland. That college has been in existence for about five years, but this was the first time a representative of it had attended the winter animal husbandry course at the Queensland Agricultural College.

Father Brill, who was reared on a farm in New Zealand and who is a practical agriculturist, speaks enthusiastically of the remarkable results of experiments his college has made with Para grass, more commonly known as *Panicum muticum*. This grass, by the way, promises to be a very valuable fodder grass for dairy farmers and graziers in North Queensland. Referring to the school, he said: "It is all very well to read about things in books. To see those things being worked out in actual practice as we are seeing them at the College is what counts."

Another interesting student at the winter school was Adjutant D. V. Bignell, who is in charge of the Salvation Army Training Farm at Riverview, near Brisbane. "You can always learn something more about livestock and that is why I am attending this school," he said. In attendance also were many young farmers, and so there was a useful blend of youth and experience.

The school, as in previous years, was organised conjointly by the Departments of Public Instruction and Agriculture and Stock, with Mr. E. J. Shelton, Senior Instructor in Pig Raising of the latter department, and Mr. N. W. Briton, veterinary surgeon of the College, taking a major part in the instructional programme. The course covered the most important phases of the pig-raising industry and dairying. The College has every facility for giving detailed instruction. The piggery, dairy factory, laboratory and workshops were used for practical instruction and demonstrations, while the cinematograph and lantern were used to illustrate lectures.

A particularly useful session was the "question period" each night from 7 to 8 o'clock, when questions on the pig-raising industry and farm life generally were propounded by the students for general discussion.

On arrival, an inspection of the College activities was made by members of the school, and an inaugural address was delivered by Professor J. K. Murray.

The lecture course was opened by Mr. R. R. Keats, the College instructor in dairying, who dealt with "Milk Secretion." He also lectured on hygiene and milk products, and milk and cream testing.

Professor J. K. Murray lectured on agricultural education and bacteriology.

Plate 38.

AT THE FARMERS' WINTER SCHOOL AT THE QUEENSLAND AGRICULTURAL COLLEGE.—Mr. Shelton, Senior Instructor in Pig Raising, lecturing on Berkshire points.

In the picture (from left to right) are: Mr. E. J. Shelton, H.D.A.; W. L. Wolff, Adjutant W. Bignell (Principal, Salvation Army Training Farm, Riverview); Neil Briton, B.V.Sc. (Lecturer in Animal Husbandry, Queensland Agricultural High School and College); W. F. Kirkwood, and Rev. Father E. A. Brill (Chaplain and Lecturer, Abergowrie Agricultural College).

Mr. E. J. Shelton's lectures covered economic phases of the pig industry, selection and judging of pigs, identification of pigs, marketing, and project and pig clubs.

Mr. L. A. Downey, Instructor in Pig Raising, lectured on the appraisal of pig carcases.

Mr. N. W. Briton's subjects were the principles of feeding and breeding, common ailments of cattle and pigs, stock judging, and anatomy and physiology of cattle and pigs, and minor surgical operations.

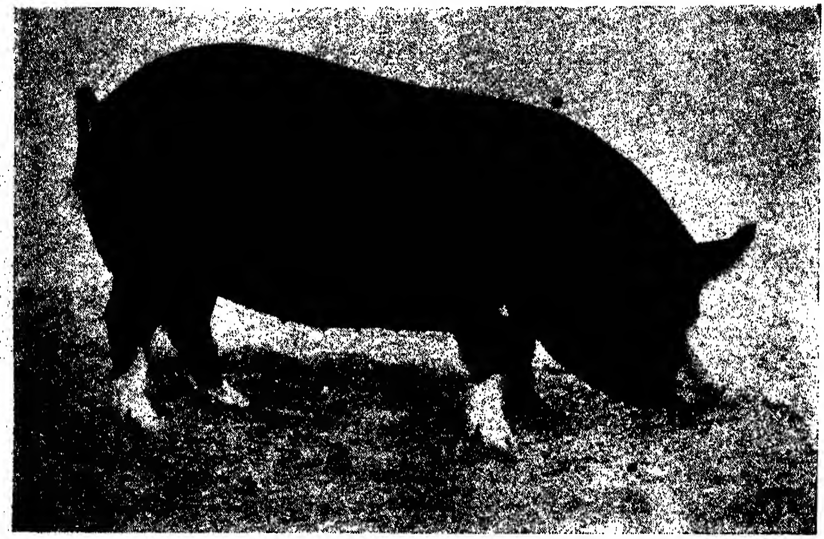


Plate 39.
"ROSELOOK LADY."—First in her class at Murgon Show. The property of Mr. Mat. Porter, Roselock, Wondai.

Plate 40
"QUEEN STATE PYGMALION."—First and Champion in his class at the Wondai Show, and first at Murgon. This boar, the property of Mr. Mat. Porter, was bred from stock imported by direction of the Minister for Agriculture and Stock.

Mr. R. Holmes, of the College staff, dealt with poultry breeding; Mr. P. J. Skerman, the growing of crops, soil formation, and composition of soils; Mr. S. Marriot, maize improvement; and Mr. W. T. Davis, farm book-keeping. Messrs. C. S. Christian and T. B. Paltridge lectured on subjects connected with plant breeding and pasture improvement.

Of the visiting lecturers, Dr. F. H. Roberts, of the Animal Heatlh Station, who has since gone to the United States of America on research work, talked for a session on animal parasites and their control. Dr. M. White, who is associated with the Meat Industry Board, also addressed the school on the meat industry and stock nutrition.

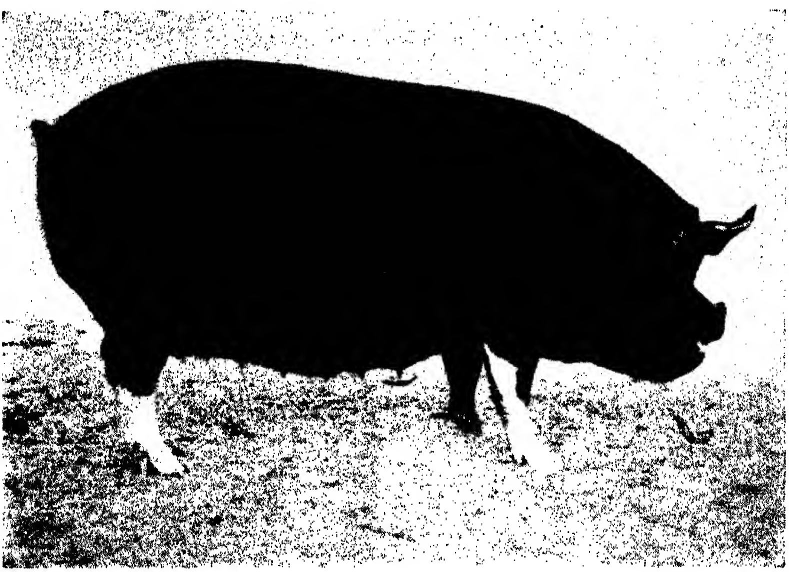


Plate 41.

"ROSELOCK ROSEY."—First and Champion in her class at the Wondai Show. This is the type of sow with which the imported boar, "Queen State Pygmalion," will be mated at Mr. Porter's Roselock Stud, Wondai.

Mr. L. Anderson, herd tester, who returned recently from a visit to Great Britain, Denmark, and other European countries, lectured on dairying and pig raising abroad. Mr. J. Ogilvie, instructor in dairying of the Department of Agriculture and Stock, lectured on various phases of the dairy industry, and Mr. G. B. Galway, inspector of accounts of the same department, discussed various aspects of agricultural economics. Other departmental lecturers were Mr. J. F. F. Reid, Editor of Publications, who spoke on "The Functions, Organisation, and Extension Services of the Department of Agriculture and Stock"; Mr. C. T. White, Government Botanist, who dealt with economic botany; and Mr. T. Abell, who talked on pig housing. Cinematograph films dealing with agricultural and other educational subjects were screened by Mr. W. J. Sanderson, official photographer, as part of the course. This year's school of instruction was one of the most popular and successful yet held.

A New Book on Plant Pest and Disease Control.

PESTS and diseases are responsible for considerable damage to valuable crops in Queensland. There is therefore a definite need for some reference publication, written in terms intelligible to the farmer or fruitgrower, containing information necessary for the diagnosis of the cause of the damage and for its effective control. This need was recognised by the Department of Agriculture and Stock some years ago in publishing "Pests and Diseases of Queensland Fruits and Vegetables" by Messrs Veitch and Simmonds, a profusely illustrated work in the field of economic entomology and plant pathology, adapted to Queensland requirements. Recently, this publication has been superseded by Volume III.* of *The Queensland Agricultural and Pastoral Handbook.* The new publication breaks a great deal of fresh ground and covers the whole field of plant pest and disease problems of any moment to agriculturalists and fruitgrowers in the State, with the exception of the problems associated with sugar-cane. As the Department sponsoring the publication is responsible for most of the entomological and plant pathological advisory and research services in Queensland, the volume constitutes a summary of the latest available information and is noteworthy for the clarity of presentation of the subject-matter.

Much of the fruitgrower's time is nowadays taken up in spraying for pest and disease control, and the farmer is also being compelled to recognise the inroads made by pests and diseases into both cultivated crops and pastures. To be successful, no one interested in fruitgrowing or agriculture can afford to be ignorant of the cause of his losses and the means of eliminating or at least reducing them. This is particularly so in Queensland, a tropical and sub-tropical State where pests and diseases are sometimes an important limiting factor to both production and development.

With the issue of the present volume, there can be little or no excuse for the mishandling of pest and disease control problems on the farm or orchard. The purchase cost is remarkably low; the presentation is as simple as the subject-matter permits, and the 254 pages contain scarcely a superfluous word. The binding is neat and serviceable, fit to ensure a place for the book on either library shelves or on a fruitgrower's packing bench for ready reference.

The subject-matter in the first part—"Insect Pests and their Control"—deals with insecticides, fruit pests, agricultural and grassland pests, vegetable pests, and general and household pests. Part II.—"Plant Diseases and their Control"—discusses fruit diseases, diseases of field crops, vegetable diseases, and the preparation of fungicides.

Altogether, the volume summarises the fund of knowledge possessed by an extensive staff of officers familiar with pest and disease problems and with the fruitgrowers' and farmers' difficulties in coping with them. It is therefore indispensable to anyone who aims at the maximum production from his property and the lessening of natural hazards in agricultural and fruitgrowing pursuits.

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* *The Queensland Agricultural and Pastoral Handbook,* Volume III; Price, 3s., post free; Department of Agriculture and Stock, Brisbane.

The Apiary.

The lowest temperatures of the year usually occur during July, and the hives should not be opened, nor should any handling or manipulation of colonies be attempted at present. Disturbance of any kind in winter induces undue activity and greatly increases the consumption of stores, while the entrance of cold air not only disorganises the cluster of bees, but also may have the effect of chilling some of the brood.

The bee-keeper has an opportunity of cleaning up the apiary during this slack month. For instance, there is probably an accumulation of old cappings or faulty combs to be melted down and processed for market. Clean tins and plenty of water should be used when melting wax. The addition of an ounce of sulphuric acid to each five gallons of wax and water when boiling will help to precipitate dirt and other impurities. In the absence of sulphuric acid a small quantity of vinegar may be used. After boiling, the tins should be covered with bags in order to cool the wax slowly to prevent it from cracking. The impurities may afterwards be scraped off the bottom of each block of wax.

Another job which may be undertaken at this time is to give each hive a coat of paint. As some bees will be flying during the day, it is advisable to wear a veil. The sides, back, and top of each hive may be painted during the day and towards evening, when flight has ceased, the front of each hive may be done and the paint will be dry before the bees commence their flight on the following day.

During late winter or early spring bee-keepers often notice many dead bees lying about the entrance to the hives. This condition is usually called spring dwindling. Strictly speaking the term should only be applied to the loss of bees in the spring due to the fact that the adults have been weakened by poor wintering and die faster than they can be replaced by the emerging brood. The consumption of late gathered honey is said to be one of the contributing causes of this trouble. This late honey is often of poor quality and may be consumed in an unripe (uncapped) condition. Losses in affected colonies have been prevented by feeding the bees for a week or so with sugar syrup, which was given warm and inside the hives. If the hive population is much depleted the bees should also be made warm and comfortable by removing supers and taking away all comb not clustered upon.

The souring of honey is also prevented by the removal of surplus combs. Generally a mild change in the weather occurs in July, accompanied by some rain, which causes a small flow of new honey, after which the trouble usually disappears.

FEEDING OF CONCENTRATES.

Farmers are often averse from feeding concentrates, which impart a flavour or "taint" to the butterfat. Peanut products are a typical example. In many cases the difficulty may be overcome by feeding the material immediately after milking. The animal then is assured of sufficient time, before the next milking, in which it can utilise the constituents liable to give the off flavours.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Ayrshire Cattle Society, and the Friesian Cattle Society, production charts for which were compiled during the month of May, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD, 350 LB.).			
Alfa Vale Gem 4th	W. H. Thompson, Manumbah road, Nanango	17,475·65	695·72	Reward of Fairfield
Sunnyside Honey 8th	P. Moore, Wooroolin	13,700·4	561·712	Bruce of Avonel
Lynthorne Mabel	G. A. Meyers, Imbil	10,460·4	420·505	Plumstone of Blacklands
	SENIOR, 4 YEARS (STANDARD, 330 LB.).			
Folkestone Pearlie	N. Bidstrup, Warra	11,426·47	457·323	Dinkum of Thorndale
Trevor Hill Bluebell	Geo. Gwynne, Umbiram	10,237·61	422·0	Viceroy of Wilga Vale
Folkestone Mona	N. Bidstrup, Warra	8,047·65	330·936	Dinkum of Thorndale
	SENIOR, 3 YEARS (STANDARD, 290 LB.).			
Rhodesview Biddy 12th	W. Gierke and Sons, Helidon	10,207·14	434·955	Blacklands Prospector
College Stately 6th	Queensland Agricultural High School and College, Lawes	9,398·05	389·631	College Robin
	JUNIOR, 3 YEARS (STANDARD, 270 LB.).			
Sunnyview Irene II.	J. Phillips, Sunnyview, Wondai	18,835·4	668·921	Burradale, Byron
Rhodesview Queenie 19th	W. Gierke and Sons, Helidon	10,300·23	385·174	Blacklands Prospector
Chelmer Angeline	E. O. Jeynes, Raceview	8,029·25	322·655	Chelmer Douglas
Trevor Hill Mermaid	Geo. Gwynne, Umbiram	7,744·91	320·287	Viscount of Corunna
	SENIOR, 2 YEARS (STANDARD, 250 LB.).			
Fairvale Judy	J. H. Anderson, Southbrook	7,879·96	357·081	Blacklands Stately Major
Trevor Hill Dove	Geo. Gwynne, Umbiram	7,374·91	313·413	North Glen Emblem
Rubyvale Marina	J. Redhead, junr., Indooroopilly	6,923·59	307·619	Blacklands Proud Monarch
Rhodesview Nancy 16th	W. Gierke and Sons, Helidon	7,991·32	294·553	Blacklands Prospector
	JUNIOR, 2 YEARS (STANDARD, 230 LB.).			
Trevor Hill Gloria	G. Gwynne, Umbiram	7,859·08	313·97	North Glen Emblem
Barwin's Queen	G. A. Meyers, Imbil	7,740·65	297·276	Blacklands Jewel

JERSEY.				
MATURE COW (STANDARD, 350 LB.).				
Oxford Joyful Maid	E. Burton and Sons, Wanora	10,110·83	570·549	Trinity Ambassador
Fauvic Rejoice	H. Cochrane, Kin Kin	7,514·5	449·294	Zingara King
Glenview Starlight	F. P. Fowler and Son, Glenview, Coalstoun Lakes	9,637·8	416·716	Trinity Officer
Oceanview Wait-a-while Fairy	J. Sigley, Millaa Millaa	7,803·05	406·465	Rocky Glen Wait-a-while
SENIOR, 3 YEARS (STANDARD, 290 LB.).				
Trinity Marshall's Coronada	C. W. Barlow, Blaxland, *via* Dalby	7,191·2	408·121	Trinity Field Marshall
Oxford Fawn	E. Burton and Sons, Wanora	7,262·4	403·001	Oxford Golden Lad
Bellgarth Buttercup 3rd	W. E. Lewty, Winera, Leyburn	5,111·75	360·317	Airlie Thorn
JUNIOR, 3 YEARS (STANDARD, 270 LB.).				
Kathleigh Royal Melba	F. W. Kath, Malakoff, Dalby	6,246·94	348·713	Retford Royal Atavist
Pineview Lorna	J. Hunter and Sons, Borallon	5,971·08	332·237	Oxford Jeweller
SENIOR, 2 YEARS (STANDARD, 250 LB.).				
Pamist of Calton	E. Burton and Sons, Wanora	7,415·68	394·475	Student of Calton
Kathleigh Royal Fashion (259 days)	F. W. Kath, Malakoff, *via* Dalby	6,166·72	385·965	Retford Royal Atavist
Kathleigh Leda's Lass (259 days)	F. W. Kath, Malakoff, *via* Dalby	6,265·0	371·814	Retford Royal Atavist
Oxford Thelma	J. Sigley, Millaa Millaa	6,078·05	313·121	Overlook Nancy's Remus
JUNIOR, 2 YEARS (STANDARD, 230 LB.)				
Oxford Melody	E. Burton and Sons, Wanora	6,798·11	375·545	Oxford Peer
Oxford Flora 2nd	E. Burton and Sons, Wanora	5,589·1	328·888	Oxford Peer
Carnation Peerless Hope	W. Spresser and Son, Redbank	4,654·46	285·576	Oxford Peer
Pineview Peerless	J. Hunter and Sons, Borallon	5,152·12	272·114	Oxford Peer
Lermont Silver Bell (Twin)	J. Schull, Lermont, Oakey	4,959·1	269·926	Woodside Golden Volunteer
AYRSHIRE				
JUNIOR, 3 YEARS (STANDARD, 250 LB.)				
Myola Lady Tina	R. M. Anderson, Southbrook	9,125·77	387·826	Benbecula Bonnie Willie
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Myola Gem 2nd	R. M. Anderson, Southbrook	12,578·23	472·052	Benbecula Bonnie Willie
Myola Opal 2nd (176 days)	R. M. Anderson, Southbrook	6,662·61	244·53	Benbecula Bonnie Willie
FRIESIAN.				
MATURE COW (STANDARD, 350 LB.)				
St. Athan Gipsy 11th (Black and White)	**W. H. Grams, Upper Tent Hill, *via* Gatton**	16,978·87	625·014	Glenvale Dutch Oak

The Tropics and Man

Some Aspects of the Racial Problem in the East.

DOUGLAS H. K. LEE, Professor of Physiology, University of Queensland.

Introduction.

WHEN you asked me to address you upon racial problems in the East, particularly as they affected Australia, I experienced a momentary panic, as my opinion upon the problem as a whole is very far from being well-defined. When I came to think over the matter, however, I saw that to feel otherwise with the very small amount of evidence before me, and for that matter, the very small amount of reliable disinterested evidence available, anywhere, would be a totally erroneous procedure. This attempt at intellectual honesty I am going to force upon you. Any candid scientist could indicate to you innumerable occasions in the history of human endeavour, when the broad outlook so essential to real progress has been completely buried under a vain commotion of assiduous argument concerning the rival merits of artificially demarcated aspects of the problem at issue. If such is possible in fields in which a definite effort is made to keep the argument in a plane above individual interests and emotions, what chance in the ordinary course of events, does the wider concept have in a field so charged with individual and racial desires and prejudices? We need attempt no more than the most superficial analysis of the volumes of heated debate on the recent Italo-Abyssinian conflict to realise with despair the entire submergence of such principles in the muddy turbulence of self-interest.

Discussion of racial questions in Eastern waters can conveniently be divided into four aspects—ethical, medical, economic and social. It is an accepted principle of scientific enquiry that natural subdivisions of operative factors in a given problem, or independent factors themselves, should be separated and studied in isolated fashion; or, in other words, we should ask Nature (and presumably human conduct is included in this term) questions one at a time. This, however, represents only the "catabolic" aspect of scientific enquiry into affairs biological. Because this represents the main aspect of enquiry in non-biological sciences, however, one is apt to forget the essential importance in biological sciences of the reverse "anabolic" process. Having studied the variables one at a time, we are still not in a position to predict the results of their simultaneous action in nature. Just as due consideration in physiology has not been given to the organism as a whole reacting to a total environment, so there has been a very grave lack of consideration of the total problem of racial inter-relations.

Having outlined in abstract the complete plan of scientific attack upon biological problems, I propose to co-opt you in an enquiry as to what reliable data we possess upon each of the four aspects I mentioned above, and then to ask ourselves whether any broad principles can be established for the regulation of our conduct and orientation of an attitude towards the really broad aspect of social questions.

2. The Ethical Aspect.

No one can leave his own countrymen and journey amongst the peoples of other nations and speakers of other tongues without asking himself just what all this international fuss and bother is about. So much is good, but the answer he supplies to his own question is not necessarily the correct one. He is in grave danger of influence by unrecognised prejudices, inherent in his original up-bringing or, on the other hand, of over-compensation for such prejudices and consequent over-statement of the other man's case. For this reason I hesitate to display my own feelings. It is difficult, moreover, to make a purely ethical judgment, as centuries of conservatism, prejudice and lack of opportunity have so often suppressed the real evidences of relative worth. The conception of equality of individuals has had to yield place in the face of hard experience to that of equality of opportunity. It is highly probable that that of a strict equality of races would have to do likewise. The position is very much complicated by the possibility or even probabality that the suitability of a given race will vary from situation to situation and from time to time in world history. Even if we are agreed that the Caucasian race is the best suited to present conditions it does not follow that it will be in a thousand years time. We may accept it, therefore, as a purely ethical principle that all races should be given equality of opportunity. Some, no doubt, would like to add to this, "Unless it can be shown that to do so in a particular case would be detrimental to the interests of mankind as a whole." I am not sure how far such a proviso would take us from pure ethics and involve us in a system of philosophy.

3. The Medical Aspect.

The first pertinent question from the Australian viewpoint is "Can the Caucasian live efficiently in the tropics?" There is every reason to believe on the basis of considerable investigation and the results of our great Queensland experiment, that the Caucasian can live and reproduce healthily in such tropical areas as we possess, *provided that he is not subject to extensive and debilitating tropical diseases.* On the other hand it is highly probable that his mental and mechanical efficiency is lower than what it would be in temperate countries. With these provisos, therefore we may raise the further question "Are there any conditions under which a mixture of races on purely medical grounds, is permissible?" It would not be in keeping with the intellectual honesty with which we blithely commenced, to assert that there are *no* conditions under which a race admixture is, for medical reasons, permissible, but the restrictions to be imposed upon such an admixture would have to be most extensive and stringent, strict medical examination and surveillance of every single entrant, the closest safeguard against unlawful entrances, forced maintenance of the highest living conditions, strict decentralisation of immigrants and prevention of the slightest crowding, the maintenance of a very strict watch over the slightest outbreak of communicable disease, and so on. Provided that such limitations could be completely and permanently enforced, admixture on medical grounds might be admissible. The point might be made here, that the introduction of non-Caucasians might be feasible under such conditions in peacetime, but that all control would be cast to the four winds in the event of even a partially successful war-like invasion by such races. Should the question of admission ever become vital, on the basis of purely medical considerations it would be infinitely preferable to maintain

peace-time control than to suffer military imposition. That a healthy co-existence of races in tropical areas is not a mere phantasma is indicated by Malayan experience, that the only scourge to which the white man is subject in such a well administered and financially sound zone is malaria. In Australia, it should not be difficult to limit this to the narrow coastal zone.

The second pertinent question concerning Australian relationships is "What medical problems will be introduced by increased facilities for and reduction of time of communication between areas habitually occupied by Caucasian and those habitually occupied by non-Caucasian races?" This is a matter that has been foreseen by the Commonwealth Health Department, and steps have been taken to meet the problem which is rapidly becoming urgent. When Australia was connected only by sea travel with its neighbouring countries, by the time a boat reached a capital city from a port infected with a communicable disease, the incubation period was very near to conclusion, if it had not already expired. Now, however, one can reach Brisbane, Sydney or Perth three and a-half days after leaving Singapore, and we are not contented with that. If quarantine for the remainder of the incubation period (up to three weeks) were insisted upon, fast travel would be entirely useless. Fortunately, we have two safeguards, the first is innoculation against certain of these diseases, and the second, weekly disemmination by the Eastern Bureau of the League of Nations of the infectious disease position at all ports throughout the East. This permits formal surveillance alone if the port of origin is clean, but ensures close surveillance if it is infected.

4. The Economic Aspect.

Under the existing conditions within the various countries involved, there is no doubt that, in general, non-Caucasian races can market goods at a price which is very much below any that can be attained by Caucasians, even when the relative quality of the goods are taken into account. I have bought a beautifully and elaborately carved Chinese chest for eighteen dollars which in the matter of carving alone could not be produced by whites for less than seventy dollars. It is reported that Japanese have claimed that they could deliver a replica of the modern Ford car in American waters for £40. Why is this so, and can the discrepancy be adjusted? It is so because the different races live in separate tanks in which the level is arbitrarily determined by standards of living and methods of manufacture, and because communication between the tanks is permitted only through an elaborate system of locks, not by any means reciprocally adjusted. How close this artificial barrier is maintained is well illustrated in Singapore. The Chinese boy can buy an article in High Street for say 20 cents, a Hindu will be charged 30 cents, a European resident 40 cents, a ship's officer 45 cents, and a tourist anything he is foolish enough to pay. As to the possibility of adjusting such discrepancies, two revolutionary changes appear to be pre-requisites—equalisation of living standards and mutual racial conciliation. The former is gradually coming about, but it will be a very long time before the *mass* of native populations is on anything like a comparable footing with that of the Caucasian populace. The latter is completely beyond expectation as long as such intense national and class prejudices as are responsible for present European turmoil are possible. It would require the boundless hope of a Messiah to envisage the day when frank recognition of racial qualities is mutually possible.

5. The Social Aspect.

Everyone is aware of the general relationship between Caucasian and non-Caucasian races. We are perfectly familiar with the general relegation of natives to menial work and the reservation of administrative and professional positions to Europeans. The questions to be answered are—(i.) Is this arrangement in its present general form workable and permanent; or (ii.) should the system be abolished? There is no doubt whatever that the system in its present form is glaringly inconsistent, that it causes just irritation in the hearts of the subject races, that all sorts of subterfuges must be resorted to for its support, and that the European himself is often subject to demoralisation by its implication. True as all this criticism is, it does not follow that the system is not susceptible to improvement, and when improved would not be the least of a number of possible evils. To throw over all control of non-Caucasian affairs in these countries which we now govern would not only be a calamity to the races concerned but a new and terrible disruption in such unity as world progress now maintains. I am told that warning examples are not hard to find in British India, and even with my short experience of the native peoples of that country as they are at present makes me not surprised at this. Corruption and intrigue are, as yet, so prevalent in the community that demoralisation can be the only sequence to abandonment of control. If a more tolerant any sympathetic attitude were adopted towards the desires and necessities of non-European races, if more effort were made to understand their point of view, which, after all, is very different from ours; if authority over them were exhibited more as a therapeutic measure than as an immutable law of creation; and administration were designed and conducted in such a spirit, then I am convinced that a very great improvement in the position would be effected. At the same time, the bad effects upon Europeans of autocratic powers somewhat haphazardly conferred would be considerably mitigated.

In so far as this question affects Australians at home, any introduction of non-European peoples should be carried out under much more enlightened conditions and with considerably more effort to understand the foreigner than is at present generally characteristic of such relationship elsewhere. Australians abroad are in a somewhat different position in that they are cast into a system already well established, and it is usually very much better for all concerned for the lone individual to fall in with existing conditions than to attempt any forced imposition of his own convictions. If in Malaya you treat the "boys" according to shining humanitarian principles, you will at once be marked down by them as a raw newcomer and an "easy mark," work will be slummed, your pocket will be drained, and tempers will be lost, all to no purpose. If, on the other hand, you commence with domination, select your servants by trial and error, and then, having established good relations with reliable servants, attempt the gradual introduction of your principles, you will be much more likely to arrive at a working compromise. In short, in individual as in mass relationship, progress is much more sure along evolutionary than along revolutionary lines.

6. The Problem as a Whole.

Let me summarise the partial answers so far developed in so far as they affect Australian policy:—(i.) On purely ethical grounds, all races should be granted equality of opportunity; (ii.) on purely medical

grounds, a mixture of Caucasian and non-Caucasian races is feasible under certain stringent and well-defined controls; (iii.) on economic grounds there are considerable difficulties in the way of racial co-existence which require equalisation of living conditions and racial conciliation for their removal; (iv.) on social grounds, a system in which the Caucasian plays the enlightened and just controller of non-Caucasian affairs is probably the best for present world conditions, but this would have to show considerable improvement upon that usually operating at the present time.

Taking into account these answers to artificially isolated questions, are there any general principles to be developed for regulating Australian attitude to racial inter-relationships in general and the question of such relationships inside Australia? It is not an argument of convenience to divide the problem thus, as the starting point for discussion is very different in the two cases. In general, Australians should encourage the idea of as wide a co-existence and co-operation of existing races as is consistent with the real evolution of mankind, they should foster the collection of as much unequivocal data as possible of the worth and power, latent as well as apparent, of the different races, and should do all in their power to adjust the existing differences between them and harmonise smaller interests to the broader outlook. In countries in which other races co-exist with Caucasians, this is merely acceptance and improvement upon the "status quo." In Australia itself, we must also accept and improve upon the "status quo," which means that in general we preserve the essential Caucasian unity of this country and admit other races only in individual cases in which it can be clearly demonstrated that no medical, economic or social disturbance is entailed. When, if ever, the time comes that the mass of other races are on an equal footing with Australians in these respects, then such a policy would automatically admit such subjects, and to such a procedure no just opposition could be made.

RADIO SERVICE FOR FARMERS.

From National Station 4QG (or 4QR) (Relayed to 4RK Central Regional and 4QN North Regional).

Arrangements have been made with the Australian Broadcasting Commission (Queensland) for the regular delivery, in interesting dialogue form, of talks to farmers by officers of the Department of Agriculture and Stock during the

COUNTRYMAN'S SESSION 4QG (or 4QR) EVERY SUNDAY MORNING,

Beginning at 9.10 a.m.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

A Species of Rattlepod.

S.C. (Pittsworth)—

The specimen is *Crotalaria incana*, a species of rattlepod or rattlebox, a native plant sometimes called native lucerne, but this name is not very apt, as we have quite good fodders which could go under the name of "native lucerne" more appropriately. Species of rattlepod have been proved poisonous to stock both in Australia and abroad, but nothing is known particularly about the properties of the present species. It is moderately common in parts of Queensland, particularly on the coast, but, generally, does not manifest itself as a very aggressive weed. Ploughed or dug in, it makes a good green manure.

Plants from Mackay Named.

D.R.McG. (Mackay)—

1. With starlike seed head. This is coastal button grass, *Dactyloctenium ægyptium*. It is common in coastal localities in North Queensland, sometimes growing in sandy land almost down to the sea. It is quite good fodder during the summer months, but mostly dies off in the winter and early spring.
2. Bloomsbury (Rat's-tail or Parramatta) grass, *Sporobolus Bertcranus*. A native of South America, it has been naturalised in Australia for a long time. It is generally regarded as inferior as a fodder, and has caused some concern in the southern dairy pasturess, because of its invasion of bare patches in paspalum paddocks.
3. Swamp paspalum (sour or yellow) grass, *Paspalum conjugatum*. It is spread very widely over the tropical regions of the world, and is generally regarded as inferior as a grass, particularly for dairying. It has invaded some of the wetter pastures of the Atherton Tableland and has caused considerable concern.
4. Devil's fig. This is a native of tropical America, now widely spread as a weed. It is very common in coastal Queensland from Gympie northwards. and devil's fig is the name usually applied to it. It is sometimes called Dirran curse, but this name belongs more correctly to another species.
5. Strychnine Bush, *Solanum Seaforthianum*, a vine naturalised recently as a garden plant, but now spread widely as a weed. The red berries have been accused of causing illness in children, and it belongs to a poisonous family. It is most frequently known as deadly nightshade. Many birds apparently eat the berries with impunity, as it seems to be spread mainly through their agency.
6. *Amarantus paniculatus*, a very common farm weed of the Amaranth family. It is not particularly aggressive, and not poisonous or harmful in any way. The leaves of several species of Amaranth are commonly used as a spinach.

"Monkey Vine."

G. (Talwood)—

The specimen submitted is *Lyonsia eucalyptifolia*, a plant very widely spread in Western Queensland and New South Wales, and commonly known as monkey vine. It is generally regarded as good fodder and is freely cut for stock. No chemical analysis is available. It has been suspected of causing trouble with stock at odd times, and it belongs to a dangerous family. Feeding this plant over a long period may be harmful, but we have no definite information. All we can say is that we know it has been often fed and found to be quite harmless. Like other fibres of a similar nature, it may cause impaction.

General Notes

Staff Changes and Appointments.

Mr. W. Dixon, Inspector of Stock, Goondiwindi, and Mr. P. P. Comiskey, Inspector of Stock, Boonah, have been appointed District Inspectors of Stock, Department of Agriculture and Stock.

Mr. W. A. R. Cowdry and Mr. W. G. Steele, Cotton Field Assistants, Cotton Research Station, Biloela, have been appointed Instructors in Cotton Culture, Department of Agriculture and Stock.

Constable W. J. Randle, Thallon, has been appointed also an inspector of brands.

Mr. K. M. Ward, M.Agr.Sc., Assistant Research Officer, has been appointed Research Officer, Horticultural Section, Division of Plant Industry (Research), Department of Agriculture and Stock. Mr. Ward is stationed at Stanthorpe.

An Order in Council has been approved under the Dairy Products Stabilisation Acts which appoints Mr. R. Wilson (Acting Director of Marketing) to be a member of the Dairy Products Stabilisation Board to fill the vacancy caused by the death of Mr. Graham.

Mr. William Kelly, Ayr, and Mr. J. B. McIlwraith, Bukali, Monto, have been appointed honorary protectors under the Fauna Protection Act.

Constable P. L. Drennan, Prairie, has been appointed also an inspector under the Slaughtering Act.

Mr. S. M. Seamer (Inspector of Stock, Brisbane), Mr. F. R. Dunn (District Inspector of Stock, Cloncurry) and Mr. D. Hardy (District Inspector of Stock, Emerald) have been appointed also inspectors under the Dairy Produce Acts.

The following police officers stationed at Roma have been appointed also inspectors under the Brands Acts:—Sergeant (1st Class) D. MacDonald, Constable L. P. Graf, Constable W. H. Fuller, and Constable G. Dickson.

The following transfers of dairy inspectors in the Department of Agriculture and Stock have been approved:—

Mr. G. F. E. Clarke, from Ipswich to Kingaroy;
Mr. E. R. Boyd, from Kingaroy to Ipswich;
Mr. M. D. O'Donnell, from Gympie to Lowood; and
Mr. W. B. Horneman, from Rosewood to Gympie.

Mr. W. S. Hartley has been appointed an inspector on probation under the Dairy Produce Acts.

The appointment of Mr. H. M. Groszmann as assistant to research officer, Horticultural Section, Division of Plant Industry (Research), has been confirmed as from 1st April, 1937.

Mr. H. G. Crofts, secretary of the Banana Industry Protection Board, has been appointed also an inspector under the Diseases in Plants Acts.

Mr. W. R. Burnett, Inspector of Stock, Toowoomba, has been appointed also an inspector of slaughterhouses.

Constable W. A. C. Zunker, of Leyburn, has been appointed also an Inspector of brands.

Messrs. J. L. Gynther (Margate) and R. K. McKee, (Murphy's Creek) have been appointed honorary protectors under the Fauna Protection Act.

Wild Life Preservation.

Ollera Creek Holding, Mutarnee, Ingham Line, has been declared a sanctuary for the protection of fauna under "*The Fauna Protection Act of* 1937."

Open Season for Duck and Quail.

On Order in Council under '*The Fauna Protection Act of* 1937" declares the periods of close season for duck and quail throughout the State. In effect, this will mean that the open season for duck and quail in the three divisions of Queensland will be:—

In Southern Queensland—From 1st May to 30th September.
In Central Queensland—From 1st July to 30th November.
In North Queensland—From 1st June to 31st October.

Rural Topics

New Methods of Soil Cultivation.

Farmers are finding out that the form and type of plough used is a matter of fundamental importance in cultivation. Ploughs vary greatly in form and in type as between one country and another, and also as between one district and another. Some very important improvements have recently been made in this respect, and the substitution of the plough by other implements and the use of new ploughing methods are under consideration. Among these implements are rototillers (which are already in use on several cane farms in Queensland), pulverator ploughs, subsoil ploughs (also in use in Queensland and in the cane country below the border of New South Wales), and cultivators with rigid prongs.

Teaching Co-operation.

Courses in co-operative production and marketing are now taught in forty-five out of the forty-eight agricultural colleges in the United States, and the number of students doing this course this year greatly exceeds all previous enrolments. This is said to be the most intensive organised effort on behalf of agricultural co-operation ever undertaken in any country. Out of this is expected to come a sounder, better informed and more prosperous farming population. When the budding farmer completes his agricultural college course he will have an infinitely greater knowledge of the problems confronting agriculture and their possible solution than his father before him. And he will realise that an important factor in agricultural progress is business-like producer co-operation.

The Most Useful Tree to Man.

Of all the trees useful to man the date palm comes first, according to a list of the most useful trees compiled by the American Nature Association. The date palm has been in cultivation for more than 4,000 years. Its fruit is the main item of diet for millions of people. In addition, it supplies oil, wood, and fibre. Dates grow well in Western Queensland, and several groves of palms have been established in the Barcaldine district, while some are growing near Charleville.

The coconut palm is given second place, followed in order by the almond tree, apple, fig, mulberry (food for silk worms), olive, quinine, and rubber.

Farmers' Co-operation.

The success of a co-operative organisation—more than any other business—depends on the men who are in it. The reason for this is that a co-operative undertaking requires a closer working together than is customary in most commercial enterprises. The entire theory of co-operative activity is that better returns are made possible by this close co-ordination of interests.

This close co-ordination of interests extends not only to the members but it applies to every individual and organisation connected with the business—from the employees to the concerns with which it has outside contacts.

—*The Australian Dairy Review.*

A Bit of Farm Philosophy.

A Fassifern farmer sends this:

" 'Our doubts are traitors,
And makes us lose the good we oft might win,
By fearing to attempt.'

" 'How can I get rid of an inferiority complex?' asked one of my cobbers the other day. He has been having a bit of a rough spin and is finding it hard to meet the world. The psychologists, it is relief to know, do not regard such cases as hopeless. Here is a slab of wisdom I read the other day, and which, I think, applies:—'Even after being down and out, individuals mount to the high ground of faith in themselves. How is such a change brought about? Certainly not by assuming a pose, which may impress but brings no lasting satisfaction. There are better ways. In most cases, cure is effected by submitting oneself to the rule of reason. And reason is a power of mind fostered by learning. Therefore a man needs to cultivate an intellectual interest—one that may further his work or enrich his leisure. His feeling of insecurity because of the inferiority complex will vanish when he comes to command some field of knowledge however small it be. Mastery of it gives self-respect. Efforts to gain knowledge and skill build wholesome habits of mind.' "

Orchard Notes

AUGUST.

THE COASTAL DISTRICTS.

IN many centres the bulk of the citrus fruits, with the exception of the late-ripening varieties, will have been harvested, and cultural operations should be receiving attention.

Trees which show indications of impaired vigour will require a somewhat heavy pruning, both in respect to thinning and shortening the branches. Where the trees are vigorous and healthy a light pruning only will be necessary, except in the case of the Glen Retreat mandarin. The densely-growing habit of this variety leads to a profusion of weak shoots, which, if allowed to develop, will cause overbearing with resultant small and inferior fruit at an early age.

Where trees show signs of failing, investigations for the presence of collar rot should be made at or near ground level. The roots should be examined for disease, and in the North Coast districts for the presence of the citrus root bark channeller. A light application of paradichlorobenzene buried a few inches deep in circular drills around the tree and with the surface stamped firmly has been recommended for controlling this pest. The distance between the circular drills should be not more than 18 inches, and care should be taken to prevent the crystals of paradichlorobenzene from coming into contact with the roots. It may be necessary to repeat the application after an interval of three or four weeks.

Where it is necessary to control black spot, melanose, and scab, the fungicide should be applied at the correct time. The control measures recommended are—

For Black Spot.

Bordeaux of 3-2-40 strength or Bordeaux of 3-2-40 strength + 1 per cent. of oil emulsion—

(1) As soon as the fruit has set;

(2) About a month to six weeks later;

(3) If black spot has been serious previously, another application just prior to the February rains.

For Melanose.

The use of a similar fungicide—

(1) Immediately the fruit has set;

(2) A month to six weeks later, or more often if the weather conditions are exceptionally wet.

For Scab.

(1) Bordeaux mixture 6-4-40 or Bordeaux 6-4-40 + 1 per cent. oil emulsion immediately before the new growth commences; this will help to clean up fungus on the old scabs;

(2) Bordeaux 3-2-40 or Bordeaux 3-2-40 + 1 per cent. oil emulsion at about the middle of the flowering period; this and subsequent applications are for the protection of young foliage and fruit;

(3) Bordeaux as soon as the fruit has set;

(4) If the season is exceptionally wet, it is advisable to give one or two further applications in order to keep the young fruit and foliage well covered.

Where for any reason healthy trees of vigorous constitution are unprofitable, they may be headed back—in fact, have the whole of the top removed—leaving a few selected arms. All other branches should be cut away at their source of origin. The three or four remaining arms, of which lengths will vary from 2 to 4 feet, will form the future framework of the tree. Care must be taken to cover the whole of the exposed bark with a suitable coating of whitewash to prevent sunburn. The numerous shoots which will grow from main arms should be suitably reduced, leaving from two to four on each arm. Under favourable conditions, these will be in a fit condition to receive selected buds from desirable trees by the following autumn.

It is desirable that when shoots intended for budding have attained a length of from 6 to 9 inches, their terminals should be nipped off in order to stiffen their growth and guard against the possibility of damage by strong winds.

Fertilizing should be completed as early as possible, the mixture for the spring application being high in readily available nitrogen. Ploughing should then be completed, the depth being regulated by local conditions and the nature of the original preparation of the land. Following the ploughing, the land should be worked down to a fine state of tilth. On hillside orchards, attention should be given to the care of possible storm waters. Cultivation should be so arranged as to form shallow drains or banks along the tree rows and across the heaviest slope, leading into suitable side drains which may be grassed to prevent erosion.

The planting of trees may be continued and, with the exception of custard apples, expedited. The attention of citrus growers should be confined to varieties suited to their local conditions.

The pruning of grape vines should be completed, and where cuttings for planting are required these should be selected, trimmed, and heeled-in in slightly dry soil. Canes intended for cuttings should not be allowed to lie about and dry out, but should be treated the day they are severed from the plant. Cuttings are frequently made of excessive length. From 10 to 12 inches is a suitable length which allows for insertion in the soil so as to permit of the top bud, with a short section of the internode, protruding above the surface.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL pruning other than that applied to peaches and varieties which are late in coming into growth should be completed this month, and the planting of young trees, if not already done, should no longer be delayed. Early planting is preferred, the sooner after the fall of leaves the better. When there are indications of the swelling of the buds, the time is opportune for working over unprofitable trees, where the stock is reasonably vigorous. Strap grafting, as advised by the local field officers, is the most satisfactory method of top-working deciduous trees.

The pruning of vines should be postponed as long as circumstances permit, and these can only be gauged on actual observation as they are subject to much variation.

The usual winter working of the land is essential for the retention of moisture and aeration of the soil, but in shallow soils in which many orchards are planted deep working is most detrimental. The matter of seedling stocks for apples and the inferior plants frequently received from Southern nurseries prompts a query as to how many seeds have been stratified for spring planting, and whether any effort is being made towards raising a local supply of nursery stock.

THE DIGNITY OF FARM LIFE.

In a book published recently—"The Land, Now and To-morrow"—Professor R. G. Stapledon, Director of the Welsh Plant-breeding Station, makes some very outspoken comments on education and the drift to the cities. "Our method of education," he says, "has undoubtedly accentuated the drift from the country to the town, because it tended to equip the more intelligent, even of country children, rather for the life in towns than for that of the country." The professor holds that the whole trend of education has been to glorify book learning and proficiency in the various subjects. "Subjects," he declares, "there are no subjects! It is only the true countryman who appreciates that life is life and learning is learning, and that all divisions into subjects are artificial and man-made." The professor condemns the "pigeon-holing of a boy's mind at school, which renders him unsuited for life in the country, which demands, above all things, an almost sublime naturalness, devoid of all artificial mental restrictions and barriers. Wisdom is the capacity for seeing life whole, and for bringing to bear on the problems of life all the knowledge of which man is possessed." He says, "I have more than a strong suspicion that wisdom is associated with simplicity and naturalness, and therefore that wisdom can be heightened by a closer contact with the country and the doings of the country, and perhaps by taking greater heed of the lessons of the country and of Nature." And then comes this interesting observation:— "I do not think I have ever met a real farmer who is a prig. Prigs there are in plenty behind the counter. You will meet them as chauffeurs, and in almost all walks of life, but they do not exist among agricultural labourers, whilst aristocrats—and not snobs—are to be found in every parish trudging behind their ploughs."

Farm Notes

AUGUST.

AUGUST is normally a dry month throughout the State, but where good soil moisture exists the advent of warmer weather will cause weed growth to increase, necessitating the use of cultivators in growing crops and land being prepared for maize, cotton, sorghums, &c.

Well-worked land having reserves of subsoil moisture is essential for satisfactory subsequent growth, as spring sown crops often have to withstand moderately dry conditions until the occurrance of early summer storms.

In coastal districts where frost is not liable to occur, early sowings can be commenced of maize, sorghums, millets, sudan grass, pumpkins, and melons, together with the planting of arrowroot, artichokes, sweet potatoes, &c., but unless ample soil moisture is present, there is little to be gained by very early sowings before the soil is sufficiently warm, as later-established areas will often make rapid growth, equalling or excelling that of earlier sowings.

Potato planting will be carried on in the Downs, South Burnett, and other areas away from the coast, where July plantings are likely to be affected by frost, the bulk of the spring crop being established during July and August.

Potatoes show a partiality to thoroughly prepared virgin soils, more especially deep, friable well-drained alluvial loams and scrub soils, which indicates that the maintenance of a supply of humus in the soil is essential for profitable yields.

Seed potatoes for this crop are usually procured from the Southern States, where certified seed true to varietal type is now available, but to prevent seed-bourne disease all seed should be treated either by the hot formalin or corrosive sublimate methods, full particulars of which are obtainable from the Department. Whole sets are preferable, but cut sets may be used for the spring planting, dusting the cut surfaces with wood ashes or slaked lime shortly after cutting.

Dairymen in many districts will now be utilising early sown winter fodder crops to maintain production, and where crops are grazed, temporary subdivision will prove valuable in conserving growth and providing fresh pastures at frequent intervals.

On the Downs the grazing of wheat areas, intended ultimately for grain, should cease by late July, otherwise probable yields are likely to be considerably reduced.

AGRICULTURAL POLICY IN BRITAIN.

Agricultural policy has been made a matter of greater urgency, if not of greater importance, by the recent events in Europe. Few in the Old Country seek to disguise the anxiety to which these events have given rise. The fundamental consideration is food supply should events reach a crisis. Agricultural policy is therefore directed to increase in home production—a fact not without significance to Queensland producers of exportable commodities. The policy of national defence is to make the land produce adequate food supplies for the nation. Two elements in the present situation in Britain which are causing worry are the decrease in the area of land under cultivation and the somewhat alarming decrease in the number of workers on the land. The development in farm mechanisation in the last dozen years cannot compensate for this loss, although the more extensive use of machinery does increase the amount of production per man employed in agriculture.

Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

CARE OF TWINS.

LAST month we talked about natural feeding and we said that there was no perfect substitute for mother's milk or for nursing by a healthy mother.

We are aiming to have all our babies fed naturally. We have talked to you about the care of the expectant mother who forms the environment and provides the food for the developing child before birth Child-bearing is a natural process, but it makes extra demands upon the organs of the mother's body and everything should be done to keep her fit and prepare her to meet these demands with the least amount of strain. This is why we recommend the expectant mother to report to her doctor regularly or, if she has no doctor of her own, to attend an ante-natal clinic.

From time to time twins make their appearance. There is a fear in the minds of some expectant mothers regarding the possibility of their giving birth to twins, particularly where there is a history of such an event in either branch of the family. Interesting as the idea of twins may be to an outsider, they become a problem to the busy mother who already may have other young children to be cared for The task of caring for them is made easier if the mother is able to secure suitable and especially trained assistance.

The healthy mother is able to nurse twins providing the babies are fully developed and that she has an adequate supply of milk. She is able to save a good deal of time if she feeds them simultaneously.

In order to carry this out satisfactorily it is important that she should be able to make herself comfortable The mother may sit on a bed and rest her back against pillows placed at the head of the bed, or she may prefer to sit on a couch with a high back and place her feet on a stool. When the infants are young they may be held in the natural position each being supported by an arm of the mother. As they become older and more active, it will be found more convenient to place each infant on a pillow stretching across the mother's lap on to the couch or bed on each side, the heads of the infants being near together and their legs away from the body of the mother.

When the supply of milk is adequate in both breasts the twins are put alternately to each breast:—

6 a.m.: A to right, B to left breast.
10 a.m.: A to left, B to right breast.
2 p.m.: A to right, B to left breast.
6 p.m.: A to left, B to right breast.
10 p.m.: A to right, B to left breast.

By adopting this method an approximately equal stimulus is applied to both breasts for the sucking power of each infant varies, and often one breast will yield its milk more easily than another. A number of mothers attending our Baby Clinics have followed this plan very successfully and with great economy of time.

When the supply of breast milk is inadequate for both babies the following method is found convenient and proves satisfactory:—

6 a.m.: A to both breasts, B artificially fed.
10 a.m.: B to both breasts, A artificially fed.
2 p.m.: A to both breasts, B artificially fed.
6 p.m.: B to both breasts, A artificially fed.
10 p.m.: A to both breasts, B artificially fed.

The following day B is breast-fed at 6 a.m., 2 p.m., and 10 p.m., and so on.

When one of the twins is much weaker than the other or shows an intolerance for the artificial food, it is advisable to give him the greater amount of breast milk, at least until he is thriving well. If he is too weak to suckle satisfactorily, give him expressed breast milk by means of a pipette or small, narrow-lipped spoon, until he becomes strong enough to take the breast, to which he is placed for short periods at first. The spoon is preferred to a bottle because some babies refuse the breast when they become accustomed to an artificial nipple or teat.

In practically every case the babies can be at least partly breast-fed. When complementary feeding has to be resorted to and one baby requires to be fed partly and the other wholly artificially at each feeding, it is necessary to hold the bottles so as to exercise a certain amount of resistance against the pull of the child in order that his power of suction will become developed. The practice of allowing a baby to lie in his cot sucking the teat of a feeding bottle supported by a pillow, so that the fluid runs into his mouth, is to be heartily condemned. The development of the jaws like the development of other parts of the body depends upon the amount of work they do, and by improving the power of suction the jaws become stronger. This favours the nutrition

of the teeth which are lying in the jaws as well as the proper spacing of the teeth when they erupt. When the babies are fortunate enough to have two people in attendance at feeding time their handling becomes relatively easy. When the mother is alone, feeding becomes a long and tedious task unless she can devise a method by which they can be fed simultaneously.

One method is provided by the mother sitting between two cots in which the infants are placed facing her. Resting an arm on a pillow placed on the edge of each cot the mother helds a bottle in each hand. As in the case of natural feeding, she may find it convenient to sit on a couch placing the infants facing one another on a low pillow on each side of her. Resting her arms on a pillow placed on her lap she holds a bottle in each hand.

IN THE FARM KITCHEN.

SIMPLE WAYS OF MAKING MERINGUES.

In making meringues the baking is of first importance. Here are a few simple recipes:—

Meringues.

Beat the whites of two eggs to a stiff froth; add very gradually three heaping tablespoonfuls of sugar. For one shell drop two tablespoonfuls on to a damp board covered with white paper and place in a very cool oven for fifteen or twenty minutes or until they are set enough to handle without breaking; then remove from the paper, and very carefully hollow out the soft inside, and place in the oven until the outside is crisp. Success lies in the baking; if the oven is too hot, they will scorch and have a bitter taste. Place two shells together, using whipped cream as a filling. The shells should be filled just before serving.

Meringue Glaces.

Take 1½ tablespoonfuls custard-powder, 1½ pints milk, 2 oz. sugar, 12 meringue cases, 2 oz. glace cherries, ½ pint cream, 2 oz. sugar.

Mix the custard-powder with one gill of the milk. Boil the rest of the milk and pour it on the mixed custard-powder, stirring all the time. Simmer for five minutes and leave till cold. Pack the freezer as tight as possible with ice and freezing salt. Strain the custard into the other end and freeze for one hour, stirring the ice cream well together every fifteen minutes. When ready to serve, whip the cream, and when it is stiff stir in about 2 oz. of sugar. To serve the meringues glaces, place a lump of firmly frozen ice cream between two meringue cases and decorate with a few dabs of cream and cherries.

Peach Meringues.

Take 1 small tin peaches, some shortbread biscuits (allow one for each peach), 1 egg-white, 1 tablespoonful castor sugar, jam.

Drain the peaches from the syrup and place one on each biscuit—cup side downwards. Whisk the egg-white to a stiff froth and then fold in the castor sugar. Turn the meringue into an icing bag with a rose tube fixed in the bottom of it, and force it out to form a border all round each peach. Put in a cool oven to set and lightly brown the meringue, and when cold serve with a little jam on top of each peach. Allow one for each person.

Meringue Trifle.

Take 6 pairs meringue cases, some sponge fingers, about 2 tablespoonfuls rum, milk, 1½ gills cream, glace cherries, angelica, sugar, and vanilla flavouring.

Arrange the meringue cases in a dish in pairs to form a border. Whisk the cream till it thickens, and sweeten and flavour it to taste. Split open the sponge fingers (or cakes) and then use them to fill up the centre of the ring, soaking each layer with a little milk and rum, and putting whipped cream between them. Heap the remainder of the cream on top and decorate with glace cherries and leaves of angelica.

Meringue Charlotte.

Take 1 packet pineapple jelly crystals, 6 oz. finger-shaped meringue biscuits, 2 eggs, 1 pint hot milk, 3 oz. sugar, ½ pint cream, 1 oz. gelatine, 2 oz. crystallised pineapple (chopped), ½ gill cold water.

Dissolve the jelly crystals in one pint of hot water, pour half into a tin, and let it set. Soak the gelatine in the cold water for five minutes, and dissolve it in the remainder of the liquid jelly. Beat the eggs and sugar; stir in the hot milk. Pour the custard into a double saucepan and stir until it is thick enough to coat the back of a spoon. When cold, strain in the gelatine. Whip the cream, and add it to the mixture with the pineapple, stirring it often as it begins to thicken. Place the biscuits round the tin. When the cream mixture is almost solid put it into the lined tin; it should come just above the top of the biscuits. To serve, shake gently out on to a dish.

Lemon Rice.

Take 8 oz. rice, 8 oz. sugar, 2 lemons, water.

Boil the rice and drain it. Pour cold water over it till the water is clear. Boil barely one gill of water with the sugar, lemon juice, and the grated rind of the lemons until this syrup is quite thick (letting the sugar dissolve before it comes to the boil). Mix this with the rice. Simmer them in a double saucepan for an hour. Remove it from the heat, let the rice cool, and use as directed.

Meringue Jelly.

Take 1 packet jelly crystals, hot water, 2 egg-whites.

Dissolve the jelly in the hot water, making it up to a pint with the jelly. Then turn it into a fairly large basin and leave it until it begins to set. You can use any flavoured jelly, and sometimes can utilise left-over fruit juice for this purpose instead of using so much water. It can also be flavoured with a little sherry if liked. When the jelly begins to thicken, add a pinch of salt to the egg-whites and whisk them to a stiff froth. Then add them to the jelly, and whisk them all together before turning the meringue jelly into a glass dish. Let the jelly set, and decorate it tastefully and serve it with cream. Meringue jelly looks just as attractive served in individual glasses.

Meringue Rice.

Take 4 egg-whites, 4 oz. icing sugar, 2 oz. almonds, 2 oz. chocolate, lemon rice, cream.

Heap the lemon rice in a fireproof dish. Beat the egg-whites and add the sugar gradually, also the chopped almonds. Cover the rice with this mixture. Put into a cool oven to brown the meringue slightly. Melt the chocolate and add a little water. Pour this over the rice, so that it runs down in streaks. Serve the meringue rice with the whipped cream. A thicker covering of meringue may be made if liked.

Chocolate Meringue.

Take 3 meringue cases, 1 oz. cocoa, 2 oz. sugar, 1 pint milk, 2 eggs, ½ gill water, ½ oz. gelatine, ½ pint cream (whipped), vanilla essence.

Soak the gelatine in the water. Mix the milk gradually with the cocoa and sugar. Stir till it boils, and add the gelatine. Cool slightly and add the beaten eggs. Stir in a double saucepan till it thickens. Add the vanilla and strain into three compote dishes. When set put sliced bananas round the edge and a meringue case decorated with cream in the centre of each.

Apricot Meringue.

Take 1 small tin apricots, 3 eggs, 1 breakfast-cupful white breadcrumbs, 2 oz. castor sugar, 1 oz. icing sugar, 1 teaspoonful orange flower water.

Boil the milk, pour it on to the breadcrumbs, return both to the saucepan, and bring to the boil. Beat the egg-yolks with the castor sugar, and stir them into the breadcrumbs and milk. Slice the apricots and lay them in the bottom of a fireproof dish. Mix a quarter of a pint of the syrup from the apricots with the milk mixture, also add a teaspoonful of orange flower water, and pour this over the apricots in the dish. Bake in a moderate oven until the mixture sets, then remove it from the oven. Whip the egg-whites to a stiff froth and put them into a forcing-bag with a large rose pipe. Ornament all the top of the pudding with this, then sprinkle with icing sugar. Bake in a moderate oven until it is a pale golden colour. When cooked, stand the dish on a lace paper. Put a pie-dish collar round it and serve either hot or cold.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MAY, IN THE AGRICULTURAL DISTRICTS TOGETHER WITH TOTAL RAINFALL DURING 1938 AND 1937, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May, 1938.	May, 1937.
North Coast.	In.		In.	In.
Atherton	2·26	37	1·38	1·42
Cairns	4·53	56	3·19	2·61
Cardwell	3·62	66	2·98	2·64
Cooktown	2·81	62	1·40	0·62
Herberton	1·74	52	0·44	1·27
Ingham	3·63	46	7·91	2·27
Innisfail	12·42	57	10·52	3·59
Mossman Mill	3·85	25	4·11	1·53
Townsville	1·27	67	0·39	0·13
Central Coast.				
Ayr	1·10	51	..	0·24
Bowen	1·28	67	0·11	0·17
Charters Towers	0·78	56	0·43	0·03
Mackay	3·78	67	4·17	0·92
Proserpine	4·27	35	2·67	1·27
St. Lawrence	1·75	67	1·95	0·06
South Coast.				
Biggenden	1·67	39	5·80	0·28
Bundaberg	2·55	55	7·62	0·52
Brisbane	2·72	86	11·81	0·25
Caboolture	2·77	51	14·20	1·24
Childers	2·07	43	6·32	0·61
Crohamhurst	4·70	45	..	0·54
Esk	1·90	51	9·78	1·73
Gayndah	1·54	67	4·03	0·06
Gympie	2·76	68	8·77	0·51
Kilkivan	1·79	59	4·98	0·03
Maryborough	2·95	67	6·58	0·26
Nambour	4·59	42	26·71	0·94
Nanango	1·49	56	4·62	0·31
Rockhampton	1·59	67	2·34	0·09
Woodford	2·79	51	15·27	0·47

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May, 1938.	May, 1937.
Central Highlands.	In.		In.	In.
Clermont	1·25	67	5·32	..
Gindie	0·86	39	..	..
Springsure	1·21	69	3·07	0·30
Darling Downs.				
Dalby	1·28	68	2·25	0·08
Emu Vale	1·11	42	2·87	0·29
Hermitage	1·10	32	..	0·26
Jimbour	1·18	50	1·13	0·20
Miles	1·43	53	6·24	..
Stanthorpe	1·78	65	2·53	0·34
Toowoomba	2·11	66	6·75	0·66
Warwick	1·48	73	3·59	0·29
Maranoa.				
Roma	1·34	64	8·31	..
State Farms, &c.				
Bungeworgorai	0·78	24	..	..
Gatton College	1·48	39	..	0·32
Kairi	..	..	..	..
Mackay Sugar Experiment Station	3·30	41	4·11	0·59

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MAY, 1938.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means.		Extremes.				Rainfall.	
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·89	83	74	85	1, 5, 27	67	18	140	18
Herberton	..	75	60	79	29, 30	54	21	44	5
Rockhampton	30·05	80	64	86	28	53	31	234	10
Brisbane	30·15	74	60	83	4	54	31	1,181	11
Darling Downs.									
Dalby	30·14	75	52	82	4	41	9	225	7
Stanthorpe	..	66	47	77	3	30	31	253	10
Toowoomba	..	69	52	79	3	39	31	675	10
Mid-Interior.									
Georgetown	29·93	90	65	93	26, 27	53	17	..	..
Longreach	30·03	84	57	90	3, 4	47	31	20	1
Mitchell	30·11	75	51	84	3	39	31	192	6
Western.									
Burketown	29·93	90	67	93	8, 9, 28	59	25	..	..
Boulia	30·04	80	56	90	3, 11	49	5, 6	..	..
Thargomindah	30·07	76	56	88	13	43	6	169	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	July. 1938.		August. 1938.		MOONRISE. July. 1938.	MOONRISE. Aug., 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·46	5·6	6·35	5·21	9·7	9·42
2	6·46	5·6	6·34	5·22	9·50	10·20
3	6·46	5·7	6·33	5·23	10·22	11·0
4	6·46	5 7	6·33	5·24	11·7	11·42
						p.m.
5	6 45	5·8	6 32	5 25	11·43	12·26
					p.m.	
6	6·45	5·8	6·31	5·25	12·22	1·14
7	6·45	5·8	6·31	5·26	1·2	2·2
8	6·45	5·9	6·30	5·26	1·45	2·55
9	6·44	5·9	6·29	5·27	2·30	3·47
10	6·44	5 9	6·28	5·27	3·16	4·37
11	6·44	5·10	6·28	5·28	4·7	5·32
12	6·44	5·10	6·27	5·28	4·59	6·25
13	6·43	5·11	6·26	5·29	5·53	7·18
14	6·43	5·11	6·25	5·29	6·43	8·10
15	6·43	5·12	6·24	5·30	7·36	9·7
16	6·43	5·12	6·23	5·30	8·28	10·4
17	6·42	5·13	6·22	5·31	9·21	11·5
18	6·42	5·13	6·21	5·31	10·17	..
						a.m.
19	6·42	5·14	6·20	5·32	11·11	12·3
20	6·41	5·14	6·19	5 32	..	1·5
					a.m.	
21	6·41	5·15	6·18	5·33	12·12	2·5
22	6·41	5·15	6·18	5 33	1·11	3·4
23	6·40	5·16	6·17	5 33	2.14	3·55
24	6·40	5·17	6·16	5·34	3·10	4·45
25	6·39	5·17	6·15	5·34	4·19	5·32
26	6·39	5·18	6·14	5·35	5·17	6·15
27	6·38	5·18	6 13	5·35	6·10	6·53
28	6·37	5·19	6·12	5·36	6·59	7·35
29	6·37	5·20	6·11	5·36	7·42	8·15
30	6·36	5·20	6·10	5·37	8·23	8·57
31	6·35	5·21	6·9	5·37	9·1	9·39

Phases of the Moon, Occultations, &c.

4th July	☽	First Quarter	11 47 p.m.
13th ,,	○	Full Moon	1 5 a.m.
20th ,,	☾	Last Quarter	10 19 p.m.
27th ,,	●	New Moon	1 54 p.m.

Apogee, 12th July, at 7.0 a.m.
Perigee, 26th July, at 9.0 p.m.

March, which from the beginning of the month has travelled from Gemini into Cancer, will set with the Sun on the 24th and disappear from the evening sky, having, in fact, been invisible to the naked eye for some time. On this day Mercury, in Leo, will pass Regulus on the path of the planets. They will be seen near the horizon in the north-west when darkness falls.

On the 29th at 7 p.m. Venus and the Moon, a very slender crescent, will be separated by 6 degrees, the length of the Southern Cross. On the next day the Moon, Venus, and Mercury will not be far apart as they are nearing the western horizon. On the 31st the invisible Neptune, very near Venus, will also be in the gathering of planets.

Mercury rises at 7.26 a.m., 40 minutes after the Sun, and sets at 5.50 p.m., 44 minutes after it, on the 1st; on the 15th it rises at 8.6 a.m., 1 hour 23 minutes after the Sun, and sets at 6.51 p.m., 1 hour 39 minutes after it.

Venus rises at 9.8 a.m., 2 hours 22 minutes after the Sun, and sets at 7.50 p.m., 2 hours 44 minutes after it, on the 1st; on the 15th it rises at 9.4 a.m., 2 hours 22 minutes after the Sun, and sets at 8.11 p.m., 2 hours 59 minutes after it.

Mars rises at 7.18 a.m. and sets at 5.38 p.m. on the 1st; on the 15th it rises at 6.57 a.m and sets at 5.25 p.m.

Jupiter rises at 9.11 p.m. and sets at 10.3 a.m. on the 1st; on the 15th it rises at 8.10 p.m. and sets at 9.7 a.m.

Saturn rises at 12.36 a.m and sets at 12.6 p.m. on the 1st; on the 15th it rises at 11.42 p.m. and sets at 11.25 a.m.

In the early evening, when the finest part of the Milky Way is coming into view, the Constellations partly in and near it will be from east to west; Sagittarius, the Archer, the Scorpion, the Pointers, the Southern Cross and Argo Navis On the ecliptic lie Regulus and Spica. Almost due north of Spica the brilliant Arcturus in Bootes, is most conspicuous among many small stars. North-east of Arcturus the Northern Crown will be seen on moonless nights: a circlet of small stars with one bright gem, Gemma, in the centre and just below Scorpio, suspended from nothing hangs a chain of very small stars: the Southern Crown.

3rd Aug.,	☽	First Quarter	12 0 p.m.
11th ,,	○	Full Moon	3 57 p.m.
99th ,,	☾	Last Quarter	6 30 a.m.
25th ,,	●	New Moon	9 17 p.m.

Apogee, 8th August, at 1.0 p.m.
Perigee, 23rd August, at 3.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 38 minutes; and at Oontoo, 48 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.

Vol. L 1 AUGUST, 1938 Part 2

Event and Comment

Queensland's Pastoral Year.

THERE are now approximately 22,200,000 sheep depastured within the State. This is an increase of over two millions compared with the previous year. The figure for the current year is the highest recorded since 1932, when the total was 22,324,278. Cattle have increased approximately by 50,000, the estimated number being 6,000,000. Many graziers have introduced new blood from overseas or the Southern States, in conformity with a general plan to raise livestock standards.

The frozen beef export trade remains about the same as in previous years, but chilled beef exports continue to indicate a steady increase. Statistics issued by the Australian Meat Board show that for the last two years, the percentage of beef exported from this State, as compared with the total export from the Commonwealth is over 90 per cent.

Except in some of the central and far western pastoral districts where seasonal rainfall has been sub-normal, stock has wintered well. Recent beneficial rains in the more favoured parts of the State have assured sufficient spring pasturage.

Prices for fat sheep, and especially lambs, have been profitable to the grazier throughout the year, and compare favourably with quotations in other States for similar classes of stock.

The demand for grazing properties in Queensland shows a firming tendency, and denotes confidence of investors in the pastoral industry and in the State. The end-of-the-season wool sales were held in June, and clearances were satisfactory. It is regretted, however, that prices were not maintained, and that an aggregate decrease of nearly £3,000,000 in the value of the season's clip has to be recorded. An aggregate offering of 483,561 bales of wool was sold in Brisbane during the season and realised £7,626,056. The average price for greasy wool throughout the year was 11·98 pence.

The Year in Agriculture.

FOR the farmer, it was generally a favourable year. Pasture and water supplies were ample for all requirements, but, as can be expected in a country with such a wide diversity of climatic conditions, there was a considerable variation in seasonal circumstances. The heavy summer rains received throughout the main agricultural regions from late October to February assured an abundance of grass and fodder crops, and permitted the conservation of larger reserves for livestock than had been possible for some years.

The wheat industry is expanding in the Western Downs, Maranoa, and Central Districts. Considerable areas of new land have been brought into production, particularly in districts now freed from prickly pear. Crops were adversely affected by late sowings, insufficient soil moisture, rust, and storms, but in spite of all vicissitudes, an over-average yield was obtained from a record acreage. It is confidently anticipated that State requirements of wheat will be fully met within a few years. Maize growers in the North have had another favourable season, but in the chief southern maize districts yields were under average. Because of the difficulty in obtaining satisfactory returns from maize in the drier farming regions, some attention is being given to the cultivation of grain sorghums, which besides showing greater drought resistance, may be harvested by mechanical means. This season's cotton crop returns, while affected adversely by unfavourable climatic conditions, have undoubtedly demonstrated that cotton should have an important place in the cropping rotations on farms in the south-eastern part of the State. Ample evidence of the value of growing cotton in rotation with grassland was again obtained by farmers individually, and also by experiment. It is confidently anticipated that this practice will be applied on an increasing scale in the future, to the benefit of both cotton yields and the productivity of the pastures. Substantial additions have been made to the storage silos at Kingaroy, the centre of a fertile peanut and general farming district. The peanut industry is also expanding in the Central and Northern districts. The area cropped with tobacco and the quantity of cured leaf marketed, were comparable with the returns of the previous season. Although weather conditions were less favourable, prices received for good leaf have shown a substantial increase. The cultivation of a wide range of subsidiary crops—such as potatoes, pumpkins, panicum, canary seed, broom millet, and arrowroot—has been carried on successfully throughout the year.

The Sugar Industry.

FOLLOWING the harvesting of a record sugar cane crop in Queensland in 1936, production advanced still further to create another record in the 1937 season. The tonnage of cane crushed—5,140,000 tons—was less by 32,000 tons than that of 1936, but the sugar content of the cane was unusually high and permitted the manufacture of 762,794 tons of sugar, an increase of about 18,000 tons over the output of 1936. Another Queensland record was achieved by the production of 3·05 tons sugar per acre of cane harvested; and a world's record was established by the seasonal average manufacture of one ton of sugar from only 6¾ tons of cane. Because of an advance in overseas prices, somewhat improved values ruled for "excess" sugar; while the average price paid for No. 1 pool sugar was £17 11s., as compared with £17 1s. 4d. for 1936. A total of 422,000 tons of sugar was exported but, fortunately, arrangements were made to market a substantial proportion of this sugar before the International Sugar Agreement came into operation; otherwise, the Australian quota would have been exceeded and a carry-over of stocks would have been inevitable.

In spite of the comparative failure of late summer monsoonal rains, preliminary estimates indicate that the 1938 cane crop will at least equal the previous record. Because of late growth, however, it is anticipated that the average sugar content of cane will be considerably below the record figure registered last season.

The continuous improvement in aggregate and unitary yields, recorded in recent years, irrespective of seasonal circumstances, is evidence of concentration on improved methods of production by the Queensland sugar industry and its technical advisers.

Dairying.

DECREASED domestic supplies early in the year improved dairy produce values, which were maintained as a result of higher prices abroad. Production has been increasing rapidly since the widespread autumnal rains and the year ended with nearly all butter factories working at full capacity. The steady expansion and development in this industry is clearly illustrated in the monthly returns of many factories at which new records have been established.

The standard of butter quality maintained has been most satisfactory, over seventy-five per cent. of the butter submitted for grading having been of choice quality. Bacteriological and chemical surveys of factories by officers of the Dairy Research Laboratory, resulting in improved water supplies and methods of manufacture and handling, have contributed largely towards this achievement. A butter standardisation service, which aims at the manufacture of a butter of uniform and economical composition is conducted by the laboratory, and the general employment by factories of this service would be of immense value to the industry.

Pure bred cows qualifying for entry to the advanced registers of the several herd book societies returned some excellent yields, which compared favourably with those obtained in other States.

Brown Spot of the Emperor of Canton Mandarin and its Control.

L. F. MANDELSON, B.Sc.Agr., Research Officer, and F. W. BLACKFORD, B.Sc.Agr., Assistant to Research Officer.

BROWN spot of the Emperor of Canton mandarin is a serious disease, the distribution of which is apparently restricted to New South Wales and Queensland. Observation indicates that it occurs only in the variety mentioned which, however, is of considerable importance to these two States. The disease was first observed in Queensland at Howard in 1928, and it was apparently confined to that locality until early in 1934, when it was found to be present in the Elimbah district. Brown spot has been known to occur in New South Wales for many years past, where its control is considered to be a major citrus problem.

Symptoms.

The most conspicuous symptom of the disease is the spotting which occurs on the rind of the fruit. Shortly after the fruit sets, the first sign of infection may be observed as a black dot on the surface. As the fruit develops, these lesions become larger, until eventually they become sunken, chocolate coloured, circular spots varying in size from $\frac{1}{8}$ in. to $\frac{3}{8}$ in. in diameter, with a raised area in the centre, as though the spot originated from an injury due to a prick of some kind. (Plate 43.) The fruit may be infected anywhere on the surface, a very common point being at the insertion of the stalk. Spotted fruit have a tendency to fall especially when half grown. Under Queensland conditions it is not often that a fruit is found with more than one spot, but this is sufficient to cause it to drop.

The disease also appears on the twigs, infection occurring in two forms. Terminal shoots are frequently observed to be discoloured brown, and are curled over as though scorched by fire. (Plate 42.) The transition from diseased to healthy tissue in this type of lesion is very abrupt. The other type of twig infection appears as dark, sunken spots, similar to those appearing on the young fruit. Large masses of gum may exude from these spots which later tend to enlarge and form cankers.

Dark-brown spots, often surrounded by a light-green to creamy coloured halo, occur on the leaves, frequently on the margin, resulting in a decided puckering and distortion. (Plate 42.) Affected leaves, like the fruit, show a tendency to fall, and after a light shower of rain followed by a breeze, a scattering of pale-green, young leaves is frequently found under a diseased tree, each leaf showing one or more spots.

Affected trees tend to produce new growth almost continuously throughout the season, and this tender tissue usually becomes rapidly infected, with the result that the tree bears a large amount of dead wood.

Causal Organism.

As yet, the identity of the causal organism of the disease is in doubt. Darnell-Smith and MacKinnon[1] claim that *Colletotrichum gloeosporioides* is responsible. Noble et alia[5] in a recent publication from the New

South Wales Department of Agriculture state, however, that there is some evidence to the effect that the disease is due to a bacterial pathogen, but this has not been definitely determined.

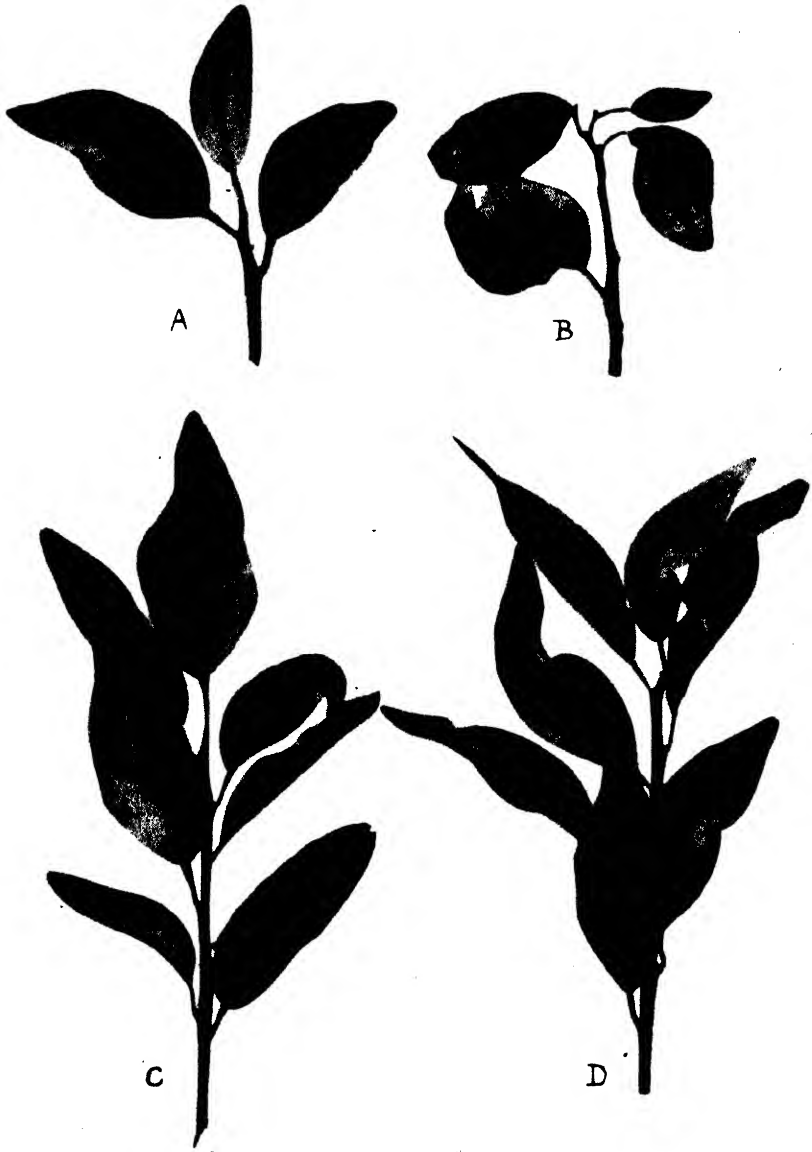

Plate 42.

Brown Spot of the Emperor of Canton Mandarin—Foliage infection.

A, C, and D—Leaf spots and distortion.

B—Twig infection, withertip stage. (Slightly reduced.)

Isolations made by the junior author in Queensland have demonstrated the frequent presence of a species of *Gloeosporium* in both the fruit and leaf spots. This fungus has also been cultured from pustules

of spores found on the surface of the brown spots on fruit kept under moist conditions. Inoculations on the uninjured rind of picked fruit with loopfuls of spore suspensions of certain strains of this fungus isolated from leaf spots have resulted in the production of spots typical of those of the naturally occurring disease. In a few instances, typical spots accompanied by distortion have been produced by spraying young leaves on budded nursery trees with spore suspensions. Up to the present it has not been possible to distinguish between the pathogenic fungus and *Colletotrichum gloeosporioides* as the latter occurs in a saprophytic capacity on citrus.

There is thus some justification for concluding that brown spot in Queensland is caused by a species of *Gloeosporium*, but in view of the conflicting opinions held elsewhere, further confirmatory work is desirable and will be attempted.

Results of Previous Investigations.

Spraying experiments for the control of brown spot were initiated in New South Wales. In 1914-15, Darnell-Smith[2] was responsible for a series of experiments in the Gosford district of that State. He found that Bordeaux mixture was more efficient than lime sulphur, formalin, copper sulphate or potassium sulphide. He reported that fairly satisfactory results were obtained when trees were pruned and sprayed with Bordeaux mixture (6-4-50) in August and December, and with Bordeaux mixture (3-2-50) in February. Mandarin trees were apparently not adversely affected by this treatment, but red scale infestation was increased. In 1924, the New South Wales Department of Agriculture[3] recommended that after pruning out the dead wood the trees be sprayed with Bordeaux mixture (6-4-50) before they blossom, again in December, and also in February or March. It was further stated that this fungicide could be reduced to half strength after the disease had once been brought under control. It is now considered that an extensive spraying programme is uneconomical in that State and it is suggested that a system of skeleton pruning providing air drainage without promoting vigorous growth be resorted to if the severity of the disease is to be lessened.[5]

Control Experiments in Queensland.

1931-32.

Attempts by Queensland growers to combat the disease did not meet with much success, and, therefore, control experiments were initiated in 1931. The trees selected were in an orchard in the Howard district which had been affected the previous season. The New South Wales work referred to above had shown that applications of Bordeaux mixture provided some measure of control of the disease, and, consequently, experiments were based on this finding.

It was anticipated that such a treatment under Queensland conditions, though maybe proving a suitable control measure, would result in a big increase in the scale population. Accordingly, an attempt was made to combine an insecticide with the copper fungicide in the two later applications. Bordeaux mixture (3-2-40 plus 1 per cent. red oil) was applied in late September (when half the blossom had fallen) and mid-October. In November and February, sprays consisting of combinations of Burgundy mixture with the soap-washing soda insecticide

together with 2 per cent. red oil were used. These combination sprays were not a success, however, as the mixture formed a thick, paint-like precipitate which made spraying difficult. However, the trees suffered no injury and the percentage of diseased fruit was reduced from 39·2 (unsprayed trees) to 19·1.

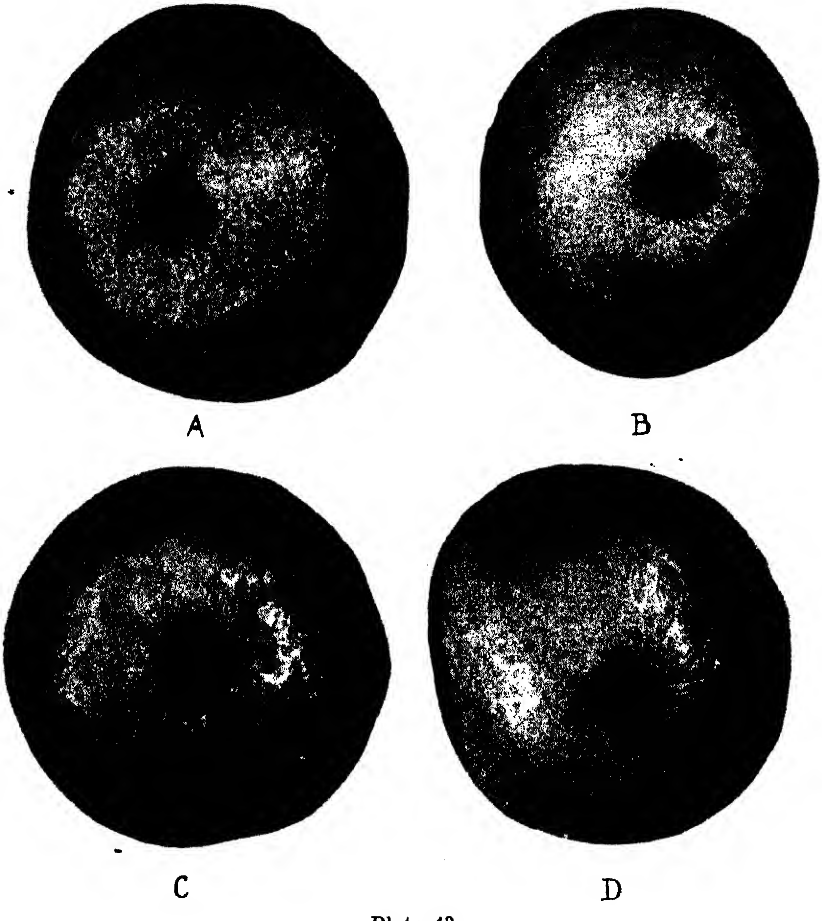

Plate 43.

BROWN SPOT OF THE EMPEROR OF CANTON MANDARIN—Fruit Spots.
A—Stylar end infection. C—Stalk end infection.
B and D—Cheek infection. (Slightly reduced.)

1932-33.

In this season's experiments, no attempt was made to combine the fungicide with insecticides, the control of scale insects being effected by a resin-caustic soda-fish oil spray in April. The block of trees sprayed in the previous year was again used in this and all subsequent experiments.

A comparison was made of a four-spray schedule with a shorter one of three applications. In the longer schedule Bordeaux mixture (3-2-40) was applied in late September (when half the blossom had fallen), late October, mid-November, and late February, the late February spray being omitted in the shorter one.

Unfortunately, an infestation of Rutherglen bug caused a serious loss at blossoming time, some of the plot trees being badly affected, necessitating their exclusion from the experiment when considering the results. However, the experiment demonstrated the effectiveness of the longer schedule which reduced the disease incidence from 53·2 per cent. to 9·9 per cent. The shorter schedule merely reduced the percentage of diseased fruit to about 30. From observations made before the scalicide was applied, there was some evidence that Bordeaux mixture increased the scale population. Too much reliance cannot be placed on these results as the trees varied much in yields, but the value of the February application is apparent.

1933-34.

In the experiments this season an endeavour was made to find some substitute for Bordeaux mixture which would provide adequate control of the disease and which would not cause such an abnormal increase in scale population as to necessitate the application of special control measures. The control of such scale infestation as did eventuate was achieved by the application of a resin-caustic soda-fish oil spray in April. The times of the four applications of the sprays were the same as those of the previous season.

Bordeaux mixture was included this time in combination with 1 per cent. red oil and 0·25 per cent. Agral I respectively. Two copper sprays employed by the senior author in experiments for the control of blue mould in tobacco,[4] and one containing no copper were tried out for the first time.

The sprays used and the average percentage of diseased fruit in each treatment were as follows:—

	Diseased fruit. Per cent.
Bordeaux mixture (3-2-40 plus 1 per cent. red oil) ..	11·7
Bordeaux mixture (3-2-40 plus 0·25 Agral I)	12·2
Shirlan AG 2 lb. to 40 gallons	45·9
Home-made colloidal copper 1 : 25 (= approximately 1½ lb. copper sulphate to 40 gallons)	25·3
Copper emulsion (= approximately 3 lb. copper sulphate to 40 gallons)	23·2
Controls (unsprayed)	45·8

As there were only a few trees in each treatment, this experiment must be treated as being merely of a preliminary nature. Bordeaux mixture provided the best measure of control. Home-made colloidal copper and copper emulsion showed promise, but Shirlan AG did not prove at all successful.

It was observed that Bordeaux mixture caused an increase in scale infestation. The quality of the fruit from trees sprayed with Bordeaux mixture was also inferior to that on control trees. On the other hand, the home-made colloidal copper and copper emulsion sprays did not have these detrimental effects. Of these two sprays, the former has the advantage that it is easier to prepare.

1934-35.

As colloidal copper showed promise in the previous experiment, this year's work aimed at comparing this fungicide at varying strengths and with different spreaders with Bordeaux mixture. The strength of approximately 1 in 13 colloidal copper (3 gallons of stock solution to

TABLE 1.

Spray Schedules in 1934-35 Experiments.

Treatment.	August.	September.	October.	December.	February.	Per cent. Diseased Fruit.
A		Bord. (3-2-40 + 1% oil)	Bord. (3-2-40 + 1% oil)	Burgundy (+ soap and soda)	Bord. (3-2-40 + 1% oil)	10.3
B	Bord. (3-2-40 + 1% oil)		C.C. (1 : 13 + soap) ..	C.C. (1 : 13 + soap and soda)	C.C. (1 : 13 + soap) ..	5.2
C			CONTROLS.			24.7
D		Bord. (3-2-40 + 1% oil)	C.C. (1 : 13 + soap) ..	C.C. (1 : 13 + soap and soda)	C.C. (1 : 13 + soap) ..	9.2
E		C.C. (1 : 13 + soap) ..	Bord. (3-2-40 + 1% oil)	C.C. (1 : 13 + soap and soda)	C.C. (1 :13 + soap) ..	7.8
F		C.C. (1 : 13)	C.C. (1 : 13)	C.C. (1 : 13 + soap and soda)	C.C. (1 : 13)	4.6
G		C.C. (1 : 22)	C.C. (1 : 22)	C.C. (1 : 22 + soap and soda)	C.C. (1 : 22)	12.6
H		C.C. (1 : 13 + oil) ..	C.C. (1 : 13 + oil) ..	C.C. (1 : 13 + soap and soda)	C.C. (1 : 13 + oil) ..	8.0
J		C.C. (1 : 13 + soap) ..	C.C. (1 : 13 + soap) ..	C.C. (1 : 13 + soap and soda)	C.C. (1 : 13 + soap) ..	8.4
K		C.C. (1 : 13 + Agral I) ..	C.C. (1 : 13 + Agral I) ..	C.C. (1 : 13 + soap and soda)	C.C. (1 : 13 + Agral I) ..	10.9

40 gallons of water) was decided on, as this spray, when ready for use, has the same copper content as Bordeaux mixture 3-2-40. In all the schedules except that involving Bordeaux mixture, the spray concerned was combined with the soap-washing soda scalicide in December. In the case of the Bordeaux mixture schedule, washing-soda was used instead of lime for the scalicide combination so that the spray for this application was strictly a Burgundy mixture. The soap and washing soda were added to the fungicide in considerably smaller proportions than those used in the 1931-32 experiments in order to avoid mechanical difficulties. The details of the schedules used are given in Table I.

Owing to the large number of treatments and the limited number of suitable trees available, only a few trees could be included in each treatment. A hailstorm considerably damaged the crop in late February and the yields of individual trees were very variable, due partly to this factor. This forms an additional reason for the results being interpreted with caution.

However, a few points are outstanding. Treatment F with colloidal copper proved effective in reducing the incidence of the disease and compared favourably with any of those in which Bordeaux formed a part. The addition of spreaders did not improve the efficiency of this spray to any extent. Bordeaux mixture applied as a pre-blossom spray appears to be superior to the same spray applied at half blossom, but the significance of this small difference is uncertain. The weaker strength of collodial copper, treatment G, did not reduce the incidence of the disease as effectively as the spray at full strength.

It was observed that where Bordeaux mixture appeared in a schedule, an abnormal increase in scale population was evident. This was particularly so the later in the season the Bordeaux mixture was applied. Colloidal copper, however, did not show this effect.

1936-37.

A four-spray schedule for the control of a disease is a big item of expenditure, both of time and money in the citrus orchard. For this reason an attempt was made in this season's experiments to reduce the number of spray applications necessary, employing home-made collodial copper, 1 in 13, as it had proved of most value in previous work. Five different schedules were tried, the details of which are given in Table 2.

TABLE 2.

SPRAY SCHEDULES IN 1936-37 EXPERIMENT.

Treatment.	Mid September.	Mid October.	Mid November.	Mid December.	Late February.
1	*B.	†C.C.	..	C.C.	C.C.
2	C.C.	C.C.	..	C.C.	C.C.
3	C.C.	C.C.	..	C.C.	..
4	C.C.	C.C.	..	..	..
5	C.C.	..	C.C.	..	C.C.
6	Controls (Unsprayed).				

* B = Bordeaux mixture (3-2-40).

† C.C. = Colloidal copper (1 in 13).

The first spray was applied when half the blossom had fallen. The control of scale infestation was achieved by the application of a soap-washing soda-oil spray in late November, and a white oil spray in mid-March. These sprays were chosen and applied at the discretion of the orchardist.

Thirty trees were used in the experiment and were divided into five blocks, so that the experimental layout conformed to that of five randomised blocks with six trees each.

As in previous experiments, a count of diseased fruit was made at the time of picking, which was carried out in three stages. As brown spot causes a large amount of fruit to fall, the fruit on the ground under the trees was gathered at the first picking, classified, and counted. These counts appear in Table 3.

As the layout of the plot permitted statistical analysis, several analyses were made in order to avoid taking into consideration, when drawing conclusions, any differences due to external factors in the experiment. The two most important analyses are given in Tables 4 and 5.

From the abovementioned tables and analyses the following conclusions can be drawn:—

(1) There were no significant differences in the original number of fruit (the sum of those picked and fallen), on the trees in the various treatments. It may be taken that subsequent differences in yield of healthy fruit can be attributed to the effects of sprays.

(2) Treatments 1, 2, and 5 have resulted in a considerable reduction in the number of fallen fruit (the majority of which were infected with brown spot) when compared with the unsprayed trees.

(3) These same treatments have also reduced the number of diseased fruit picked.

(4) The three treatments which provided the most effective control showed the highest yield of healthy fruit. Of these three treatments, treatment 5, under the conditions of 1936-37 season, showed slightly the better yield, and being of three spray applications is naturally to be preferred to No. 1 or No. 2 of four applications.

An increase over unsprayed trees of at least a case of healthy fruit might be expected from the application of three colloidal copper sprays as in treatment 5, when trees of size and yielding capacity similar to those of the experiment are being considered. Treatments 1 and 2 did not give such a big increase in yield.

It must be noted that the three spray schedule which proved so successful in the 1936-37 experiments was tried out in an exceptional season. In the months September, October, and November, barely 3 inches of rain fell in the district.

1937-38.

In further investigations with collodial copper in this season, in which the control of brown spot was incidental, the three-spray schedule was used together with one in which Bordeaux mixture (3-2-40) was substituted for the first two applications. These schedules reduced the incidence of brown spot from 16·4 per cent. on unsprayed trees to 4·2 per cent. and 4·5 per cent. respectively. In contrast to the previous season the rainfall in the September-November period was 10 inches, so that even under heavier rainfall conditions the three-spray schedule can be expected to provide good control, colloidal copper being just as efficient as Bordeaux mixture (3-2-40).

TABLE 3.

FRUIT COUNTS—1936-37 EXPERIMENTS.

Details of Sprays.		Number of Tree.	Picked from Tree.			Ground Pick-up.			Total.	Per cent. of Total Diseased.	Average.
			Diseased.	Healthy.	Total.	Diseased.	Healthy.	Total.			
Treatment 1.	Bord. Mid September	15	19	789	808	15	2	17	825	4.1	4.9
	C.C. Mid October	14	39	1,178	1,217	26	12	38	1,255	5.2	
	C.C. Mid December	13	16	323	339	2	3	5	344	5.2	
	C.C. Late February	12	40	1,255	1,295	32	12	44	1,339	5.4	
		11	51	1,329	1,380	14	20	64	1,444	4.5	
Treatment 2.	C.C. Mid September	25	9	988	997	10	5	15	1,012	1.9	4.5
	C.C. Mid October	24	33	812	845	10	11	21	866	5.0	
	C.C. Mid December	23	28	658	686	5	5	10	696	4.7	
	C.C. Late February	22	47	1,432	1,479	39	12	51	1,530	5.6	
		21	34	884	918	18	15	33	951	5.5	
Treatment 3.	C.C. Mid September	35	42	575	617	27	8	35	652	10.6	16.5
	C.C. Mid October	34	105	486	591	45	11	56	647	23.2	
	C.C. Mid December	33	56	610	666	26	14	40	706	11.6	
		32	148	1,291	1,439	74	32	106	1,545	15.3	
		31	111	604	715	61	11	72	787	21.8	

Treatment 4. C.C. Mid September, C.C. Mid October	45	89	434	523	28	2	30	553	21.1	22.6
	44	121	665	786	42	10	52	838	19.5	
	43	102	301	603	88	11	99	702	27.1	
	42	74	390	464	58	3	61	525	25.3	
	41	83	552	635	60	13	73	708	20.2	
Treatment 5. C.C. Mid September, C.C. Mid November, C.C. Late February	55	48	1,240	1,288	11	3	14	1,302	4.5	5.2
	54	52	1,126	1,178	23	10	33	1,211	6.2	
	53	32	1,025	1,057	10	3	13	1,070	3.9	
	52	67	1,180	1,247	27	9	36	1,283	7.3	
	51	18	655	673	13	10	23	696	4.4	
Controls—No spray.	65	129	288	417	30	6	36	453	32.9	38.9
	64	331	783	1,064	79	4	83	1,147	35.7	
	63	151	347	498	69	2	71	569	38.7	
	62	183	379	562	118	11	129	691	43.5	
	61	118	269	387	101	13	114	501	43.7	

TABLE 4.

ANALYSIS OF VARIANCE OF HEALTHY FRUIT.

Source of Variation.	D.F.	Sum of Squares.	Mean Square.	S.D.
Blocks	4	564,578.2	141,144.55	..
Treatments ..	5	1,789,814	357,962.8	..
Error	20	1,314,647.8	65,732.39	±256.383
Total ..	29	3,669,040	..	..

F for treatments = 357,962.8/65,732.39 = 5.44 which is significant. (P. < .01).

S.E. of mean = $\pm$ 256.383$\sqrt{5}$ = $\pm$ 114.66.

S.E. of difference of means = $\pm$ 114.66 × $\sqrt{2}$ = $\pm$ 162.129.

Throughout all experiments, pruning, fertilizing, and cultivating were left to the discretion of the orchardist. Trees were kept well pruned so that the growth was open, allowing greater ease in spraying. No attempt was made to estimate the value of pruning as a factor in the control of the disease. Data relating to the effect of sprays on the incidence of the disease on leaves and twigs was not taken as it was not considered of value. Spray applications to control these phases of the disease would have to be very frequent, as the trees produce susceptible young growth right through the season.

TABLE 5.

MEAN NUMBER OF HEALTHY FRUIT PER TREE.

Treatment.	Mean of 5 Trees	S.E.	Significantly Exceeds (P. = .05).
1	974.8	±114.66	4, 6
2	954.8	..	4, 6
3	713.2	..	..
4	508.4	..	..
5	1,045.2	..	4, 6
6	403.2	..	..

Summary.

Brown spot is a serious citrus disease affecting the Emperor of Canton mandarin in Queensland. A description of symptoms on leaves, twigs, and fruit is given.

Five seasons' experiments with sprays for the control of the disease are described.

Four applications of Bordeaux mixture (3-2-40 plus 1 per cent. red oil) reduce the incidence of the disease.

The continued application of this spray mixture results in a marked increase in the scale population of the trees.

A spray mixture, home-made collodial copper, with a copper content equal to that of a Bordeaux mixture of 3-2-40 strength proved effective in trials.

With three applications of this spray, at half blossom-fall when most of the fruit has set, eight weeks later and in late February, the incidence of the fruit spot phase of the disease is considerably reduced and the yield of marketable healthy fruit increased.

Colloidal copper sprays did not seem to increase scale infestation of the trees.

Acknowledgments.

The writers wish to express their appreciation of the help of Mr. C. E. Farmer, of Howard, who made the trees available for the experiments and who co-operated wholeheartedly in the work of spraying. Acknowledgment is also made of the help of Miss B. Shield, Assistant to Research Officer, who is responsible for the analyses of results of the 1936-37 experiments, and also of those members of the plant pathology staff who assisted at various times in carrying out the work.

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VALUE OF TREES ON THE FARM.

Trees serve many important purposes on farming and pastoral country.

Trees are valuable as—

1. Windbreaks and shelter belts.
2. For isolated or scattered shade and shelter.
3. A reserve supply of fodder for periods of drought.
4. Timber and fuel supplies.
5. Screens around dams and tanks to prevent silting up by dust, and undue evaporation of the water.
6. For the prevention of erosion on slopes and along the banks of creeks and rivers.
7. For ornamental plantations in improving the appearance of the home.

The Control of Banana Rust Thrips.

N. E. H. CALDWELL, B.Sc.Agr., Assistant Research Officer.

I. HISTORY OF THE PEST IN QUEENSLAND.

THE history of the banana rust thrips, *Seirtothrips signipennis*, Bagn., (Plate 44) and its relation to the development of rust on banana fruit is rather a long one. It has been excellently reviewed by Smith (1934). Briefly, the species was definitely determined as the causal organism early in the century (Tryon, 1901), but rust was a well known cause of loss to banana growers in the Cairns and Goondi areas as far back as 1897 (Froggatt, 1928). Little attention was paid to the pest for a number of years, and only general recommendations were made regarding its control. It appeared to be restricted to North Queensland. However, in 1924, following the growth to vast proportions of the banana-growing industry in southern Queensland, a serious outbreak—probably actually the culmination of several years' increasing intensity of infestation—occurred in the Gympie district, at that time the largest banana-growing centre in the State. Girault (1925) made extensive observations on the bionomics of the pest and carried out certain preliminary control experiments. In 1926 Froggatt (1927) performed control experiments in North Queensland and suggested the posssbility of using calcium cyanide dusts. From 1929 to 1934 Smith (1934), from the Entomological Field Station at Cairns, devoted considerable attention to this pest and arrived at some definite conclusions concerning the control of rust in North Queensland. In the summers of 1931-32 and 1932-33, during another banana rust thrips outbreak, Weddell (1932 and 1933) in southern Queensland investigated the value of certain control measures which had received considerable publicity. Veitch (1934) summarised the then current ideas on control.

II. SCOPE OF THE PRESENT INVESTIGATION.

When the present studies were initiated, the accumulated information on the bionomics of the pest was more or less adequate for a good understanding of the problem and precluded the necessity for further detailed investigations along these lines. In addition, the rather extensive previous inquiries into the possible control measures indicated the most profitable field for further work. Thus the greater part of the time has been spent in carrying out a number of elaborate field experiments designed to assess accurately the relative merits of various control measures. The progressive waning of the thrips epidemic, coupled with a very considerable decrease in the acreage under bananas in the affected districts, hindered the investigations somewhat, but these disadvantages were, to some extent, counter-balanced by the comprehensiveness of the field work and the very careful selection of experimental sites.

In this paper, all previous information is summarised as briefly as possible and recently acquired data added. On practically every phase of the problem additional data, supplementary, confirmatory or contradictory, are available. Though the facts are sometimes meagre it is obviously desirable that all information pertaining to control measures should be marshalled together in the one account.

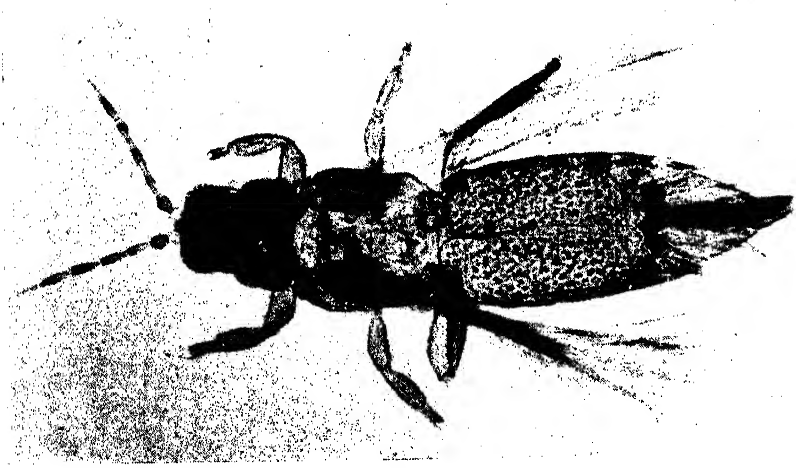


Fig. 1.

Fig. 2.

Plate 44.

The Banana Rust Thrips, *Scirtothrips signipennis* Bagn. Fig. 1, Female x 60; Fig. 2, Male x 60.

[*Photomicrographs by I. W. Helmsing.*

III. OCCURRENCE IN OTHER PARTS OF THE WORLD.

Until recently Queensland appeared to be the only country where *S. signipennis* was regarded as a pest. The species was originally described in 1913 from specimens collected on bananas in Ceylon (Bagnall, 1913). Nevertheless, it is not recorded as a pest in the entomological literature of that country. In 1935 the pest had apparently attained serious proportions in the Republic of Panama, Central America (Deal, 1935). The insect is also said to be present in Fiji, but is apparently not a pest of commercial significance in that colony (Lever, 1937). There are no recent reports of the insect in the banana-growing areas of New South Wales (Gurney, 1936), but, considering early records from the Tweed Valley (Tryon, 1920 to 1924) and the known distribution of the pest in southern Queensland during the present decade, its presence in northern New South Wales is very probable.

IV. IMPORTANCE OF THE PEST TO THE BANANA GROWING INDUSTRY OF QUEENSLAND.

The importance of the pest may be discussed from three viewpoints, viz.:—(1) the actual monetary loss incurred by growers, (2) the contribution of the banana thrips to the decline of the industry in certain centres of production, and (3) its effect on the development and expansion of the industry in the future.

(1) Broadly speaking, the banana rust thrips is found throughout all banana-growing areas north of Gympie, while south of that centre distribution is irregular. The extent of these regions is, however, no indication of their relative importance, for the area south of Gympie supplies practically all the bananas for export to the southern States, and it is in the southern markets that the grower of rusty fruit is most heavily penalised.

North of Gympie, practically all production at the present time is for the local markets. While fruit showing more than a certain severity of damage is definitely unsaleable, the local buyers and consumers appear to be tolerant of a considerable amount of blemish, and growers do not normally suffer much loss. In a year of severe rust there is a certain amount of wastage. In recent years, too, several large-scale production ventures in the far north, growing for the southern markets, have, in bad seasons, suffered very considerable loss of fruit.

In an average bad infestation, growers whose plantations are located south of Gympie may discard as much as 20 to 25 per cent. of their fruit as unmarketable, while much of the remainder will realise from 2s. to 6s. per case less than fruit of similar size and quality free from rust. Though losses vary from plantation to plantation, an average wastage of 20 per cent. and a depression in price of 2s. 6d. a case for rusty fruit is a conservative estimate of the losses in severely infested areas. Though the accuracy of the statement is rather difficult to check it is often claimed that, in a year of severe rust incidence, the growers are penalised more severely by buyers in southern States for similarly affected fruit than in a season when rusty fruit is not so prevalent.

Owing to the seasonal incidence of thrips, rusty fruit is cut only at certain periods of the year. Thus the loss referred to above is only a seasonal one, affecting, on the average, fruit cut between January and August.

(2) In the far north, rust has unquestionably proved a serious bar to banana growing, especially in large scale propositions catering for southern markets. In the south, thrips have been held largely responsible for the decline of the industry in many parts, notably the Gympie district. In both cases, however, it would appear that the importance of the pest has been somewhat over-rated. The banana rust thrips has been made the scapegoat for most of the ills to which banana production has been subject during the last decade. In the far north, fruit-fly and transport difficulties, in addition to certain fundamental cultural problems, have been important contributing factors. In the south—the Gympie district is a typical example—cultural difficulties and the incidence of adverse weather conditions during several seasons have been largely responsible for the decline. Moreover, during the years 1933-35, disastrously low prices for even good quality fruit overshadowed all other adverse influences. In many cases, however, rust proved the "last straw," and during this period it no doubt had its greatest effect in bringing about a decrease in production in certain centres.

It seems quite clear that low prices following excessive planting have resulted in a general decline of the industry in Queensland. Nevertheless, in certain areas, quite circumscribed in extent, banana rust thrips has been a major contributory factor. For several reasons, chief among which are—(*a*) severe outbreaks of the pest have been only irregularly distributed in the main areas of production, (*b*) much of the acreage which passed out of production prematurely in thrips-infested districts would have done so in any case for cultural reasons, and (*c*) a number of the growers in thrips-infested localities have transferred their activities to less susceptible areas, only a small proportion of the decrease in the acreage under bananas can be directly attributed to banana rust thrips.

(3) The rôle of the banana rust thrips in determining the progress of the industry in the future will undoubtedly be an important one. It seems probable that, unless cultural methods undergo a drastic revision, banana growing will tend to move northwards—that is, into areas particularly subject to thrips. In addition, there is no guarantee that areas in the south, which have hitherto been more or less free from the pest, will escape injury during future outbreaks. Thrips will certainly retard the rate of planting of new areas in the seriously-infested regions of the State, but in some respects this will be an advantage for only careful growers who fully understand the problem of thrips control will undertake production.

While these remarks apply equally to all parts of the State, it seems that the pest will assume its greatest importance in restricting the development of the industry in the far north where the incidence of the pest is more regular and more severe. The control measures discussed later apply only to the south. The most efficient have not yet been tested north of Gympie, and, in the light of previous experience (Smith, 1934), one hesitates to express a definite opinion concerning their possible efficacy in tropical areas. Nevertheless, they hold distinct promise for the control in such regions, not only of this pest but also of fruit fly.

V. BIONOMICS OF THE BANANA RUST THRIPS.

(1) Seasonal Life Cycle.

The insect is found in all stages throughout the year. Though there is no actual cessation of reproduction or development during the winter,

there is a marked retardation of the rate of the various life processes. The numbers reach a minimum in the late winter, there being a definite time lag between the onset of the cold weather and its effect on the insect population. Thus the lowest population level is probably reached early in August, though, by this time, even in the south, the weather has become perceptibily warmer.

In August a relatively large number of very small larvæ have occasionally been observed, indicating a slight flush of reproduction at this period. However, generally speaking, there is no perceptible increase on the winter low level before September. Thereafter, the population increases rather slowly until about November, the rate of increase apparently depending on the season. From December onwards the growth of the population is accelerated considerably and the peak is usually reached about February. There is little or no decrease in numbers until after April as a rule, and in 1935 it was the end of May before such a decrease became obvious. From then on the population decline proceeds at a rapid rate to reach the lowest level at the end of July or the beginning of August.

(2) Life History Details.

Girault (1925) made a comprehensive study of the life history and habits of the banana rust thrips during the months October to February, and the following account is based on his records, amplified, where necessary, by data accumulated in later investigations.

Egg.—The egg is most commonly laid in the soft tissues of the pseudostem and in the fruit. A few are probably normally deposited in the bunch stalk while, under some conditions, egg-laying takes place on the leaf.

The site of oviposition is usually unmarked in any way, but in some cases on the fruit "minute round pustules were formed over the egg and the larva hatches from a minute slit to one end of the centre of the pustule." Pustules on the surface of the fruit may, of course, be due to other causes, for they are commonly found on fruit free from thrips, particularly on surfaces adjacent to, or contiguous with, those of neighbouring fruits. The majority of the eggs are laid in the basal half of the fruits, as would be expected from a consideration of the habits of the adults. On the pseudostem, eggs are presumably laid in all parts frequented by the adults. On the bunch stalk the portion between the top hand and the throat of the plant, beneath the shelter of the bracts subtending the bunch, is most commonly selected as an oviposition site, as indicated by the presence of larval colonies. In the 1936-37 summer, large colonies of thrips in all stages were frequently observed on funnel leaves or on recently unfurled leaves, and there is little doubt that oviposition must have taken place in the leaf itself. This phenomenon has not been recorded previously, and it was probably brought about or accentuated by the rather exceptional weather conditions prevailing during the season. Eggs have never been found in the corm, nor have larvæ appeared on corms kept under close observation.

The average duration of the egg stage as determined by Girault was about a fortnight with a range of 12 to 19 days.

Larva.—On emergence from the egg the larva pushes its way through the surface of the plant tissue. The point of exit may often be discerned as a "minute cross-slit." In addition, the delicate amnion,

shed by the larva as it emerges, often remains as a "minute, hair-like, semi-prostrate, white thread," which further serves to distinguish the point of exit. Hatching takes place at any time of the day, but the great majority of larvæ emerge during the forenoon.

During the period of Girault's work the larval stage on the plant ranged from 6 to 10 days, and in recent investigations a duration of 8 days was recorded in April. A definite pre-pupal stage lasting 2 to 5 days is spent in the ground.

Pupa.—Pupation takes place at shallow depths in the soil. A maximum depth of 3 inches has been recorded, but lesser depths are more common. There is no pupal cell, and both prepupæ and pupæ are able to crawl slowly. Pupæ are not commonly found on any part of the plant in the field, and only three or four larvæ have ever been induced to pupate in the absence of soil in the laboratory. Full-grown larvæ confined on bananas in tubes without soil usually wander about for some time and ultimately die without completing their development.

The pupal stage has been recorded to range from 6 to 10 days. After transformation the adult remains in the soil for a short period—24 hours or less.

Adult.—After emerging from the soil the adults presumably make their way immediately to a nearby host, though whether by alar or pedal movement is not certain.

Girault records a maximum length of life of 72 days for an adult female, though the average adult life is given as about 28 days. This latter figure was computed from both adults collected in the field and laboratory-bred insects. In recent studies adults frequently lived from 50 to 55 days in confinement. Females appear to live considerably longer than males.

In the laboratory the total period of development was found to range from 29 to 38 days. The maximum duration of the whole life cycle, including the free-living adult stage, thus approaches about three months in the summer.

Mating may take place within a few days after the emergence of the adults. Parthenogenetic reproduction was observed by Girault 3 days after emergence of the imago. Thus mating may bear little relation to oviposition. The details concerning parthenogenesis, such as sex of offspring, rate of reproduction, &c., have not been elucidated.

The proportion of the sexes suggests the possibility of parthenogenesis. Although the proportion of males in field collections of the banana rust thrips has reached 50 per cent., it is usually in the vicinity of 30 per cent., and as low a figure as 13 per cent. has been recorded. There does not appear to be any correlation between the season of the year and the sex ratio.

The length of the reproductive life is considerable, and females may lay eggs for the greater part of their adult life. Girault records the case of an individual female laying eggs over a period of 64 days. Miscellaneous observations gave a range of egg-laying life of 17 to 64 days, with an average for seven individuals of 37 days. Records of the reproductive capacity of the female are rather incomplete, and suggest about 60 eggs. This figure is almost certainly too low. Eggs are laid more or less continuously, a few being deposited in the plant every day or at similar short intervals. The rate of oviposition appears to decline with increasing age.

An attempt has recently been made to determine the effect of shade on the rate of reproduction. Adults taken from bananas in the field were divided, without reference to sex, into six lots of 20 individuals each. These lots were distributed at random between single bananas, taken from the same hand of a bunch in a rust-free locality and enclosed in cotton-wool-stoppered tubes. Three tubes were wrapped in several thicknesses of hessian, while the other three were exposed to ordinary lighting conditions of the laboratory. After 15 days the first larvæ had just hatched from the unshaded fruits, but on the shaded fruits, many were several days old, and the total number was much greater. In 20 days the aggregate number of larvæ on the unshaded fruits was approximately 70 and on the shaded ones at least 350. Some of the latter were mature and had left the fruits to seek pupation sites. No larvæ appeared to be mature on, nor had any left, the unshaded bananas.

The survival rate of the adults was the same under the two sets of conditions. Owing to the ripening of the fruit the development of the insects was not followed through to maturity, but the experiment indicated clearly that reproduction is increased rather than retarded under conditions of heavy shading, the point concerning which information was required. The experiment was repeated in a subsequent season. The difference between the numbers of larvæ, while not so marked as in the above experiment, was still appreciable.

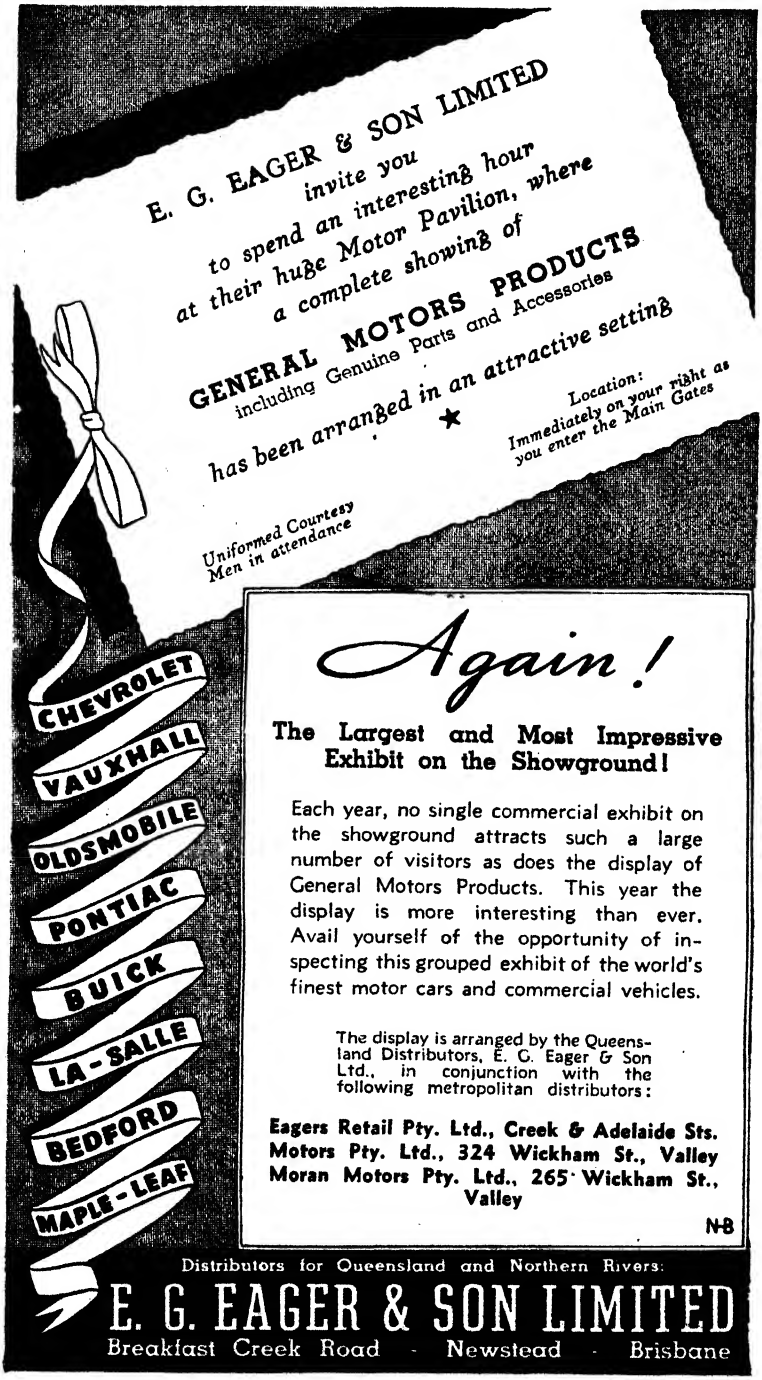
(3) Habits.

On the plant, adults and larvæ are found most commonly beneath the edges of the sheathing leaves of the pseudostem and on the fruit, somewhat less frequently on the bunch stalk and occasionally on partially-opened leaves.

On the pseudostem, the insects may be found under any leaf sheath which is not too close fitting. In the case of young suckers large colonies may be found under the leaf sheaths quite close to the ground, but on older plants the insects are usually not numerous near the base of the pseudostem. Adult and larval stages have never been found on the plant below ground level, i.e., on the corm. Towards the top of the pseudostem where the leaves diverge the insects can be readily located by tearing back the edges of the leaf sheath, although the colonies here are often not so strong numerically, particularly from the point of view of larvæ, as colonies further down the pseudostem.

Sometimes large numbers of adult insects may occur in the unfolding funnel leaf of the plant, often some distance from the throat. This phenomenon is quite common in the north during the summer months, and is not unusual in the south at the same season if the insects are at all abundant. In the cooler months the insects remain beneath the leaf sheaths.

Larvæ were not recorded on any part of the leaves until the 1936-37 summer when very large colonies of both adults and larvæ were frequently found on recently opened, as well as on still-furled funnel leaves. On the funnel leaves they were found on both surfaces; on the open leaves they usually occurred on the upper surface only. The season was an exceptionally dry one. For many weeks growth of the bananas was almost at a standstill and the funnel leaves opened very slowly. It is presumed that the persistent shelter in this leaf permitted colonisation along its whole length. An appreciable number of these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insects, especially the larvæ, apparently remained on the open leaf and completed their development in a normal fashion. The circumstances leave no room for doubt that eggs were actually laid in the leaf tissue, but the phenomenon is probably abnormal because the sheltered conditions favoured by ovipositing females are seldom available for any length of time in the funnel leaves of the normally growing plant.

On the bunches the insects are found primarily at, or near, the points of contact between fruits. They also commonly frequent any other part of the fruit which is sheltered by a closely adhering cover, such as a persistent bract or an abnormally placed leaf. At times larvæ, and much less frequently adults, may be seen on all parts of the fruit, even exposed to direct sunlight. This phenomenon has been observed only during the summer months under conditions of heavy bunch infestation. It was most noticeable during the 1936-37 summer which was exceedingly dry. On those parts of the bunch stalk separating the hands of fruit, a few larvæ have been observed from time to time, but on the stalk between the top hand and the throat of the plant, under the shelter of the two bracts subtending the bunch, small, diffuse colonies usually occur. These normally disappear after a time, following the disintegration of the sheltering bracts and the hardening of the surface of the stalk, though sub-mature larvæ have at times been observed on the stalk after all sheltering bracts have disappeared. The insects may also frequent aborted fruit towards the flower end of the bunch, and they have been found amongst male flowers still closely wrapped in bracts. It is, however, doubtful if they ever penetrate right to the end of the inflorescence. Occasionally small numbers of adults and larvæ were observed on the undersides of the bracts subtending the bunch. The insects appear to show no preference for the fruit as compared with the pseudostem.

Owing to the disposition of the banana fruits on a bunch, the most favourable area for the insects is near the base of the fruit. In this region, optimum conditions of shelter are available for the greatest length of time.

The population of the bunch is primarily derived from the population of the throat and upper portions of the plant. The adult thrips harbouring there penetrate beneath the bracts ensheathing the hands as the bunch is being everted (Smith, 1934). The hands first invaded ultimately become the top hands, though until the bunch is fully pendant they are bottom-most. Thus the thrips population of the hanging bunch is normally greatest in the top hands, the numbers decreasing towards the "flower" end. In cases of very severe infestation this gradation is more or less eliminated. Migration of flying adults on to the bunch subsequent to its being thrown may also tend to equalise the distribution of the population throughout the bunch. Once the bunch is thrown, there is little or no migration from the plant throat along the bunch stalk on to the bunch. Some insects from the colonies established on the stalk may, however, move on to the bunch as the former habitat becomes unsuitable, but these could scarcely play a significant part in the colonisation of the bunch.

The existence of thrips colonies indicates a gregarious habit, but the insects will not tolerate more than a certain degree of crowding, particularly in the adult stage. Girault (1925) records the apparent distress of very large mixed colonies in glass containers. Smith (1934) considers that the crowding of the colonies on the pseudostem causes the

population to move upwards to the plant throat and finally on to the emerging bunch. This aversion to overcrowding apparently determines the population density in any one spot, and may explain the definite upper limit to the numbers in the colonies, which vary, of course, with the habitable area. The number of insects in single colonies on the pseudostem is much larger than that on single fruits, or even on pairs of adjacent fruits, but in the first case, the area which can be occupied by a colony is much greater.

Both the size and density of colonies depends naturally on the degree of infestation and on the time of the year.

The age composition of the colonies varies with the season and the site on the plant. In well-established colonies the larvæ predominate during the summer; in the winter the adults are relatively more numerous, though probably never outnumbering the larvæ. The initial population of the bunch is wholly adult and, until reproduction has progressed sufficiently, adults predominate in the population in this site. Insects clustered in the funnel leaf during the summer are usually all adults, and in the winter, colonies of about a score of insects, all adult, have been observed under leaf sheaths. Girault records data on the composition of colonies. In the late summer 337 individuals drawn from a number of colonies included 92·7 per cent. larvæ. In July, of 1,531 specimens from the fruit 73 per cent. were larvæ, and of 2,185 specimens from the whole plant 59 per cent. were in the immature stage.

The natural gregarious behaviour is well illustrated by the distribution of small populations, which will, for the most part, be aggregated into a few colonies. No attempt is made to occupy all the suitable niches in the environment. Thus, the total population of a lightly infested, small, non-bearing plant may, for example, be found under two or three leaf sheaths.

The species has generally been considered to exhibit definite negative phototropism, but an examination of the evidence suggests that this thesis requires some modification. In the first instance, adults emerging from the soil must at least be indifferent to light, if not positively phototropic. Freshly-emerged adults in the laboratory have also been observed to ignore banana fruit in glass containers and to make their way towards the source of light. The habit of flight is also clearly indicative of at least the absence of negative phototropic reactions in the adult. The previous remarks concerning larvæ on the "outside" of banana bunches show that, under some conditions, this stage is also at least indifferent even to direct sunlight. It is worthy of note that larvæ thus exposed tend to be much more highly coloured, acquiring a deep yellow and even at times a reddish hue as compared with the pale yellow to almost white of average specimens. (*Cf.* Bailey, 1933.)

On the other hand, there is no doubt that adults require sheltered conditions for reproductive activities. Also, if colonies under leaf sheaths, for instance, are exposed by striping away the cover, all individuals, both larval and adult, quickly disperse into adjoining sheltered spots.

Thus, the phototropic reaction of the adult of this species appears to undergo a change, to which age may bear some relation, while larvæ are usually negatively phototropic but appear, under some circumstances, to be conditioned to a state of indifference to direct light.

Girault records that the distribution of the insects on the pseudostem bears no relation to the orientation of the plant in regard to the sun. He examined plants, one side of which was exposed to direct sunlight for several hours each day, but could detect no difference in the colonies in any part. In this case it might be expected that any reaction would depend on heat, rather than light. Recent attempts to detect any characteristic orientation of the colonies in the winter have similarly been unsuccessful. In normal plantation conditions, the pseudostems are more or less completely shaded, but in winter, when the effects of leaf diseases are most pronounced, foliage may become fairly sparse, and exposure of the pseudostems to a considerable amount of direct sunlight is not uncommon.

An attempt to demonstrate surface reactions was not successful. A large mixed colony was established on a banana contained in a cotton-wool-stoppered glass tube which was then wrapped in dark coloured paper so that all light was excluded. Examination at intervals over a period of a week failed to show any marked inclination on the part of either larvæ or adults to congregate at or near the points of contact between fruit and glass. Any aggregations were only of a temporary nature, and apparently due to the progress of wandering individuals being momentarily impeded by the points of contact between the two surfaces. The fairly even distribution of feeding blemishes all over the fruit also indicated the absence of surface responses.

Though a "short flying skip" was reported by Girault (1925), little information was available concerning the importance of flight in the economy of the banana rust thrips. During recent investigations, adults were captured on a 6 ft. by 3 ft. calico screen coated with adhesive material. The screen was erected in a vertical position between two rows of bananas, the bottom edge being 3 ft. from the ground. Approximately forty adults were observed in an area, 42 in. by 30 in., after two weeks' exposure, but, owing to the difficulty of detecting specimens caught in the adhesive, the number trapped may have been much greater. That the adhesive mixture exerted no chemotropic attraction for the insects was shown by the failure of smears of the material on different parts of banana plants to catch any specimens whatever. Thus there seems no doubt that the insects were trapped during normal movement, though whether from plant to plant or from ground to plant is not clear. This movement may not necessarily be true flight. Once on the wing, such small insects may be carried by air currents for considerable distances. However, for all points of practical importance, this may be regarded as equivalent to flight. True flight has since been observed in the laboratory; as a preliminary to taking off, there is a noticeable movement of wings and abdomen, suggesting that the fringing hairs of the wings are being combed out.

Adult and larval stages are very susceptible to lack of food. Experiments in the laboratory have indicated a minimum longevity of 2 to 4 hours and a maximum of 36 hours in the absence of food. Mortality is more rapid under conditions of low humidity.

Contact with soil exposed to the sun may be fatal to both adults and larvæ (Girault, 1925), but this has little practical importance. Under plantation conditions the greater part of the ground is shaded and, in any case, the majority, if not all of the larvæ, probably drop to the ground for pupation when lethal temperatures do not prevail. (*Cf.*

Bailey, 1933.) Insects already in the ground are doubtless protected by an adequate layer of soil. The effect of high soil temperatures on emerging adults is not known.

Though differences in seasonal habits may be largely correlated with differences in population density, several changes are probably due entirely to weather conditions. Locomotion is certainly slower in winter and flight is probably curtailed. During the cold weather the adults tend to cluster closely together in the colonies, either with larvæ or alone. Also the proportion of adults in mixed colonies increases markedly, probably on account of the depressed rate of reproduction. It has often been observed during the winter that all larvæ in any one colony were at the same stage of development, instead of exhibiting the normal age variation. This phenomenon is no doubt bound up with climatic effects on embryonic and larval development.

With the onset of winter, the numbers of the insect on the bunches diminish more rapidly than on the pseudostems until finally, during the winter months, the bunches are practically thrips-free. Odd adults may be found on young bunches thrown during the winter, but on more mature bunches which have carried a large population during the late summer and autumn the insects usually completely disappear. Thrips appear to be more numerous on the pseudostems of younger than older plants during the winter, though this may be partly an illusory effect due to the greater conspicuousness of the insects against the somewhat darker-coloured tissues of the younger plants.

The seasonal distribution of the insects on the plant is undoubtedly related to population density. The initial infestation of the plant is under the leaf sheaths of the pseudostem and, when the population is small, it is practically confined to this situation. As the numbers increase they tend to move upwards on the plant, firstly into the throat and the base of the unfolding leaves and then into the emerging bunch. With the winter decrease in population,, the adults tend to remain on the lower parts of the plant, from which there is little or no upward migration.

The important practical consideration in connection with this seasonal distribution is the almost entire freedom from infestation of bunches thrown between about the end of June to about the middle of September in southern Queensland, while the infestation of bunches thrown some time prior to, and after this period, is too slight to cause commercial damage to the fruit.

(4) Relationships With Other Insects.

Other insect species appear to be of little or no importance in the economy of the banana rust thrips. No natural enemy of any significance has been recorded. Most of the investigators concerned with the problem have handled fairly large numbers of the insects in the laboratory, but none has encountered any parasite of egg, larval or adult stages. Pupal parasites or predators may have escaped observation since pupæ have never been collected in any numbers from natural habitats.

Girault records that a red mite was occasionally seen fastened to both adult and larval thrips. Smith (1935) mentions the presence of a Capsid bug, commonly found in North Queensland, and considers it almost certainly predatory but of negligible importance.

In South Queensland adults and larvæ of the beetle *Cryptamorpha desjardinsii* Guer. (Fam. Cucujidæ) are commonly found in banana bunches, the former amongst the fruits and in the "flower" end, the latter only in the "flower" end. The affinities of the species and the appearance of the larvæ suggest that it is almost certainly predatory. Small dipterous and other larvæ which abound in the decaying inflorescence probably form its normal prey. Adults may feed on thrips larvæ amongst the fruits. Beetles have been reared from the larval stage in tubes containing *S. signipennis* colonies on bananas, together with a little soil, but there was no certain indication that the larvæ fed upon the thrips.

In southern Queensland adults and larvæ of a small Hemipteron (Fam. Anthocoridæ) have occasionally been seen on banana bunches, but attacks on *S. signipennis* was not observed.

Large colonies of mites were often bred in the laboratory on bananas harbouring thrips, but they were not observed to attack the thrips nor did they prevent the normal increase in population.

The chief interest of other insects in connection with the banana rust thrips problem lies in the confusion caused by two other species of Thysanoptera. These are *Thrips florum* Schmutz and *Physothrips bilongilineatus* Girault, the latter having been recorded by Girault (1925). Girault also mentions a third species, black in the adult stage, which is comparatively rare on the banana plant. It is probably *Haplothrips bituberculatus* Girault, a species commonly found on other hosts and doubtless only incidentally on bananas.

Thrips florum (Plate 45) occurs in enormous numbers co-seasonally with *S. signipennis*. The male is a small, active insect, yellowish in colour with light markings on the wings, but the female is much larger, and conspicuously red and black. The larva in both sexes is bright red. The male bears some resemblance to *S. signipennis*, but may be readily distinguished by its small size, more active movements, somewhat different shape (being tapered posteriorly and showing no signs of dorso-ventral compression), and most definitely of all, by the absence of the dark dorsal, abdominal line, due to the shading of the folded wings, and the two dark thoracic spots characteristic of *S. signipennis*. The folded wings of the male *T. florum* do give a dorsal line rather deeper in colour than the ground colouring of the insect, but this line is much less distinct than that of the other species.

The insect has a rather curious distribution on the plant. The males predominate on the outside of the bracts subtending the fruits and flowers of the bunch, the females mainly occur on the undersides of these bracts and on the floral organs of the bud and the larvæ chiefly on the floral organs of the bud. Adults of both sexes may be observed amongst the fruits of very young bunches which have not yet shed their bracts, and also in small numbers within the throat of the plant. They are not usually found under the leaf sheaths of the pseudostem.

The species seems to be rather more generally distributd than *S. signipennis*, though the largest numbers occur in "rust" localities, thus indicating somewhat similar general climatic requirements on the part of the two species.

Little attention has been paid to the life history of *T. florum*. The egg is presumably laid in the plant tissues. The duration of larval

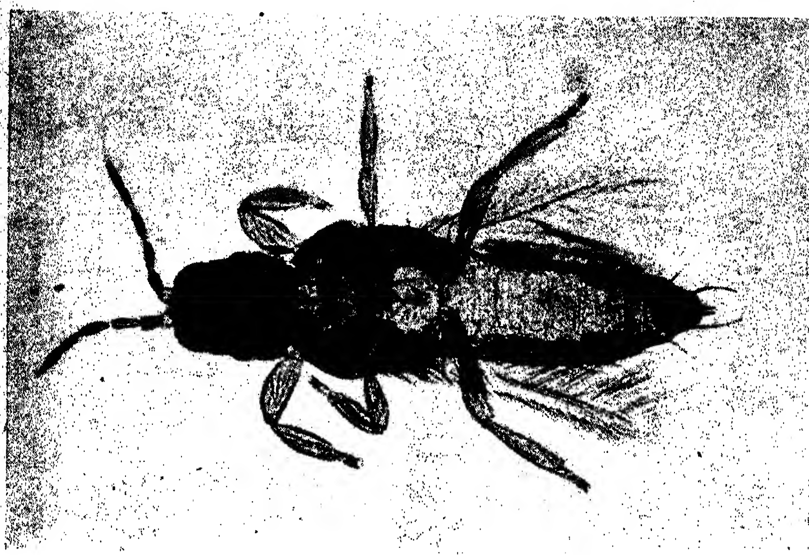


Fig. 2.

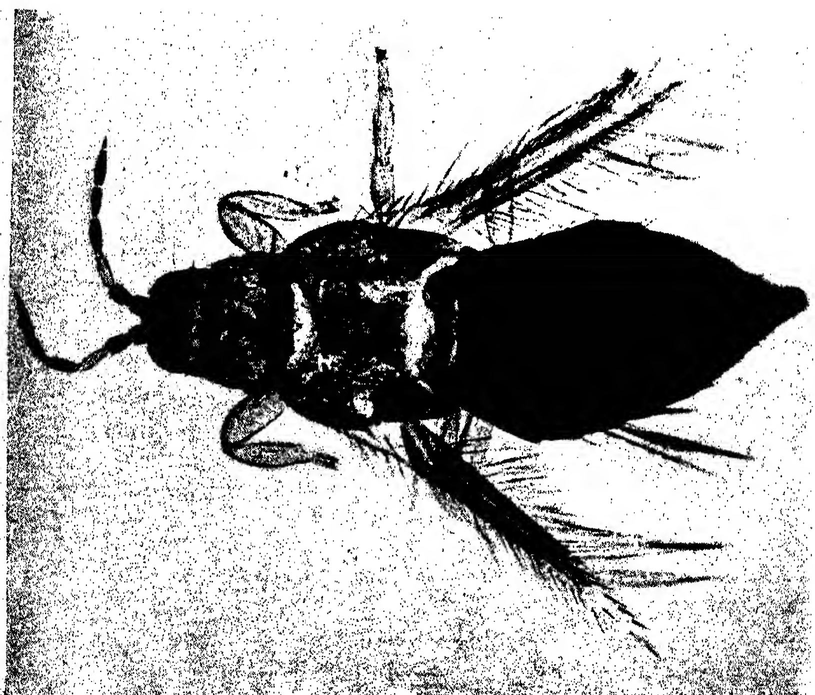


Fig. 1.

Plate 45.

Thrips florum Smutz. Fig. 1, female x 60; Fig. 2, male x 60.

and pupal stages was found to be comparable with that of the pest species. In the laboratory larvæ pupated in and on the soil. Under natural conditions they may pupate on the plant, perhaps on the decaying "flower" end. The insect appears to build up large populations rather more quickly in the spring and early summer than *S. signipennis*, but it is apparently more susceptible to cold weather, as the numbers diminish somewhat earlier in winter.

The species has been reported to cause a rusting of very young fruit in north Queensland (Froggatt, 1928). In New South Wales occasional damage similar to true rust is ascribed to *T. florum* (Gurney, 1936). Recent observations in southern Queensland have failed to incriminate the species in any type of fruit injury. Its chief importance lies in the common confusion among growers as a result of the similarity between the adult male and both sexes of *S. signipennis*. Seeing the vast numbers of little yellow insects, rather conspicuous against the dark red of the bracts, growers imagine they are about to suffer severe losses from rust.

Physothrips bilonglineatus (Plate 46) may quite pardonably be confused with *S. signipennis* in all stages by the layman. The adult, of

Plate 46
Physothrips bilongilineatus **Gir.—female x 60.**

[*Photomicrograph by I. W. Helmsing.*

which only female specimens have so far been collected, is about the same size; the ground colour is lemon-yellow rather than golden, and the two dark thoracic spots of *S. signipennis* are lacking. The dark coloured dorsal line, due to the colouration of the folded wings, is present and very conspicuous against the pale body colour. In addition, there is a distinct black band along the lateral margins of the head and thorax. The abdomen tapers posteriorly, and the whole insect, therefore, looks rather different from the elongate oval *S. signipennis*. The species also does not exhibit the dorso-ventral compression of the latter. In habits the adult is more alert. It moves much more quickly and takes to flight fairly readily.

The larvæ are lemon-yellow in colour, and when viewed under low powers of magnification, present a glistening appearance quite different from that of *S. signipennis*. Like the adult they are slender and regularly tapering. A more detailed examination shows that the larval antennæ are ten-segmented (those of *S. signipennis* being twelve-segmented) and that the characteristic funnel-shaped or sub-capitate abdominal setæ of the latter species are lacking. These two characters provide a ready and sure method of differentiating between the larval stages of the two species if suitable microscopic facilities are available.

P. bilonglineatus is fairly widely distributed in southern Queensland, but ordinarily it is found in very small numbers. Without a very careful search only occasional adults are detected. However, during the summer of 1935-36 it was noted in comparatively large numbers in one plantation, and a brief discussion of the insect, therefore, seems desirable.

Adults and larvæ are usually observed on the fruit and occasional adults have been found in the throat of small plants. In the laboratory some difficulty was experienced in handling the insect. It did not thrive under the conditions normally employed in breeding other species, and in no case was the life cycle carried through to completion on banana fruits. Nevertheless, eggs laid in fruits during April and May hatched in 12 to 19 days and larvæ were full grown in about 10 days. In June and July the pupal stage lasted about three weeks. In many respects, therefore, the life history stages are comparable with those of *S. signipennis*.

In its choice of habitat *P. bilongilineatus* differs slightly from the banana rust thrips. Larvæ and adults are usually found in more exposed positions on the bunch. While some colonies may contain both species, *P. bilongilineatus* does not usually occur in colonies of *S. signipennis* between closely appressed surfaces. The appearance and general shape of the adult particularly suggest that it does not frequent the same confined spaces as the other species. Furthermore, there is not the same strong tendency to form colonies. In no case has the population of a bunch been at all comparable with that of *S. signipennis* and, were the population to increase considerably, the insect may, of course, display similar gregarious habits. With *S. signipennis*, however, even a small population would be congregated into definite colonies.

To some extent the seasonal incidence of the two species coincides but *P. bilongilineatus* appears rather more tolerant of winter conditions, and the population on the bunches remains constant for some time after the numbers of *S. signipennis* have declined considerably. Thus fairly mature bunches, which, by inference from the amount of rust on the fruit, must have carried a large population of banana rust thrips at

one stage, harboured only *P. bilongilineatus* in June. Similarly, very young bunches thrown in winter and free from *S. signipennis* have carried a small population of the other species. However, the population density ultimately reaches the same low level. Despite this apparent greater tolerance of cold weather, its geographical range is not known to be greater than that of *S. signipennis.*

In the laboratory, colonies of this insect injured banana fruits in much the same way as the banana rust thrips in the same environment. (Rust produced in the laboratory on single fruits differs slightly from that produced on the plant, no doubt due to the fact that no growth is taking place in the fruit.) In the field it has not been possible to detect any type of injury peculiar to the species. The relative population densities of the two species on certain selected bunches suggested, however, that incipient rust markings, apparently normal in all respects, had been caused by loose colonies of *P. bilongilineatus.* The solitary individuals wandering and presumably feeding on the outside of the bunch have not been observed to cause any blemish.

At present, *P. bilongilineatus* is of no importance in southern Queensland. The numbers present in all plantations where it has been recorded have been, with one exception, completely negligible. Even in that one area it is very doubtful if the species played any significant part in the development of the severe rust which occurred during the 1935-36 summer. Should its numbers increase considerably it may introduce complications into the problem of rust control by, firstly, prolonging the rust season, and, secondly, causing an extension of the damaged area on individual fruits. Owing to the low numbers present in the plantation, it is unlikely that this insect will cause any confusion to banana growers.

Still another species of Thysanoptera (*Hercinothrips bicinctus* Bagnall) occurs on bananas in some districts, e.g., the Byfield area near Rockhampton, and in isolated localities south of Brisbane. It causes what is popularly known as "silver rust." The adult is a fairly stout, brownish-black insect, the larvæ is pure white to yellowish in colour (depending on age), and carries a conspicuous brownish blob of excrement at its anal extremity. The damage caused to the fruit is at first a distinct silvering on the surface, marked with black or brown excretal stains. In cases of severe injury the blemish may turn red and ultimately the skin of the fruit may crack. The typical injury is, however, quite different from true rust. The colonies of the insects are found more on exposed portions of the fruits than in between closely-appressed surfaces. There should be no confusion whatever between this species and *S. signipennis.* Its control constitutes a separate problem, which is at present the subject of a subsidiary investigation.

(5) Alternate Hosts.

Little attention has previously been given to the question of alternate hosts of the banana rust thrips. The insect is known to occur in vast numbers on the wild bananas in north Queensland (Froggatt, 1928), where it presumably frequents all three native species. In fact, Froggatt (1928) considers it to be indigenous on this host to North Queensland. The same worker has also collected the species in the flowers of the cunjevoi (*Alocasia macrorrhiza* Schott) in the Innisfail

district. Girault (1925) records one instance of adults feeding on tomato fruits but, as no larvæ were located, they were presumed not to be breeding on this host.

In 1935 one farmer reported their occurrance on French beans (*Phaseolus* sp.) but the report could not be investigated before the destruction of the plants. In the same year *S. signipennis* was located on a citrus orchard at Traveston, near Gympie, where sundry varieties of citrus fruits, particularly oranges, were severely blemished. Since that time the pest has been found on other orchards at Gympie, Nambour, and Palmwoods, and characteristic injury was seen on a few fruit grown at Cardwell, North Queensland. The varieties affected are oranges (several varieties), mandarins (several varieties but only to a very slight extent), lemons, citrons, and grapefruit. Strangely enough, neither thrips nor rust have ever been recorded on banana plantations at Nambour and Palmwoods, although they have been under fairly close observation for some years. The other two centres have, of course, long been notorious for rust in bananas.

In all cases, the citrus orchards have been associated to a greater or lesser extent with bananas. At Traveston, bananas heavily infested with thrips were actually growing amongst the citrus trees while there were two banana areas adjacent to the orchard. The bananas were eradicated from the orchard in 1935 but the thrips have persisted. At Gympie citrons were planted, after the eradication of the bananas, on the site of a plantation where rust had occurred. Bananas have since been grown in very close proximity to the citrus and have always been infested with thrips. The Nambour orchard adjoins a banana plantation. Although rusty fruit has been reported by some growers in the district, attempts to locate thrips on the bananas have been unsuccessful. The citrus at Palmwoods is planted on the site of an old banana plantation and a few stools of the latter remain at the edge of the orchard. Thrips were found in very small numbers on these plants and also in a plantation a few hundred yards distant.

The insects concentrate on the fruit and, as on bananas, prefer surfaces in close proximity, i.e., between fruits or between fruits and leaves, where they breed freely. They have also been observed breeding on the foliage of grapefruit when the trees were not carrying fruit. In the laboratory thriving colonies have been maintained for a year on potted orange seedlings and no difficulty is experienced in colonising orange fruits. Mandarin fruits do not seem to be suitable breeding media in the laboratory. The occurrence of *S. signipennis* on citrus is peculiar in that the population density bears little relation to that on adjacent bananas or to expectations based on topography. Biological abnormalities, such as the complete absence of males on citrus, have also been noted. These and other matters of importance are being studied at present but, as they have no direct bearing on the banana rust thrips problem, they need not be discussed in detail here.

The occurrence of *S. signipennis* on citrus prompted a more detailed search for other alternate hosts. As a result it was found on four native plants, viz., *Cordyline terminalis* and *Smilax australis* (Fam. Liliaceæ), *Gymnostachys anceps* (Fam. Araceæ) and *Flagellaria indica* (Fam. Flagellariaceæ). All were growing in plantations badly affected with rust. The insects have not been found on these or any other species growing elsewhere than among bananas, e.g., in the vegetation at the edge of banana plantations. Particular attention has been paid to those

species which form the bulk of the weed growth in plantations, e.g., cobbler's pegs (*Bidens pilosa*), rag weed (*Erigeron canadensis*), stinking roger (*Tagetes glandulifera*), sow thistle (*Sonchus oleraceus*), pigweed (*Portulacca oleracea*), shepherd's purse (*Capsella bursa-pastoris*), blue top (*Ageratum conyzoides*), and yellow weed (*Galinsoga parviflora*). Scotch thistle (*Cnicus lanceolatus*) and pineapples growing in heavily-infested banana plantations have also been examined with negative results.

The four hosts discovered form only a very small part of the weed growth; in fact, since they are all perennials, they rarely obtain a footing in well-managed plantations. In all instances where these plants were being utilised as alternate hosts little cultural attention had been given to the plantations and there was a more or less copious growth of both annual and perennial weeds.

C. terminalis, G. anceps and *F. indica* all have leaf petioles which ensheath the stem for some distance and provide shelter similar to that of the banana. In the case of *S. australis,* the position is quite different. This plant has a more or less woody stem with entire leaves and short petioles which are not sheathing. The leaves are naturally attacked by two species of Thysanoptera, probably *Euoplothrips bagnalli* Hard. and *Cryptothrips* sp., which cause a pronounced curling of the leaf margins inward to the midrib. In such curled leaves *S. signipennis* has been found, though not in association with any other species. Whether the banana rust thrips first attacked the normal leaf which then curled as a result of the damage or whether they took possession of leaves already curled could not be determined. The latter is perhaps the more likely explanation.

On all four alternate weed hosts breeding has been observed but not as prolifically as on citrus. *C. terminalis* harboured the greatest number of insects but in this case no more than 2 to 3 larvæ were found under each leaf sheath, in association with a similar number of adults. On the other weeds, the number of insects, both adults and larvæ, were small. Owing to the great difference in form and size between bananas and the other hosts, comparisons of population density are difficult.

The economic importance of alternate weed hosts is somewhat doubtful in southern Queensland. Several aspects may be considered.

It is a well-established fact that rust incidence is usually not severe on neglected plantations, especially if deprived of cultural attention for several seasons. Such areas would naturally carry a large body of weed growth. The obvious supposition that many adults emerging from the soil are diverted from banana plants to weeds is not supported by facts. Were such the case, at least some of the more commonly distributed weeds in plantations would be effective hosts. Detailed examination of the weed flora has yielded no evidence in favour of this explanation of the phenomenon.

Though the insects might travel per medium of alternate hosts across the intervening country between banana plantations, it is unlikely that this method of dispersion would have much effect on the spread of the species. Other obvious facilities for dispersion, such as the transport of infested planting material, wind, &c., would appear to be much more important. As the insect has been established in southern Queensland for many years, any marked adaptibility to native host plants would have ensured a more general distribution in the banana districts than at present.

The importance of native host plants in providing a natural reservoir for the infestation of thrips-free bananas in southern Queensland is questionable. This point must be considered in view of the possible development of methods designed to provide clean planting material. In many rust-affected areas where banana growing has declined very considerably in the last few years, much replanting will probably take place in the near future, either on land previously under bananas or on land in the vicinity. If a population of thrips has persisted on native plants, the rapid infestation of new areas established with clean planting material would be greatly facilitated. In actual practice, however, it is improbable that infestation in this way would be of any great significance. In the first place, as recorded above, *S. signipennis* does not appear to be establishing itself readily on the native vegetation. Secondly, there is no locality in which rust has previously been severe where banana culture has completely ceased. Existing plantations would, therefore, provide a reservoir of insects for the reinfestation of new plantations.

(6) Dispersion and Migration.

(*a*) *Natural Means.*—It must be assumed that, under natural conditions, *S. signipennis* is capable of a certain amount of dispersion by virtue of its habit of occasional flight in the adult stage. There is no evidence of mass migration such as occurs under some conditions in the case of *Thrips imaginis* Bagn. (Evans, 1932). A purely voluntary flight would probably cover only a few feet or a few yards but, once the insect is launched into the air, it comes under the influence of air currents. No experimental or observational data are available to demonstrate that the insects are carried over considerable distances by air currents but it does not seem unreasonable to suppose that this actually happens. The history of plantations in many localities indicates a natural method of dispersion and wind-borne flight seems the most probable. Although banana plantations are usually established in sheltered situations most of them in the southern Queensland coastal areas are sufficiently exposed for infestation to be effected in this way.

Natural dispersion by wind is probably only local in its effect. It is therefore postulated that the insects have been first introduced into various districts in southern Queensland by other means, e.g., on infested planting material, while wind dispersal has assisted in spreading them to areas of bananas in the immediate vicinity. By modifying the prevailing winds, local topography would play an important part in the direction of such dispersal. This hypothesis at least accounts for the irregular distribution of the pest in some localities where the history of the plantations does not provide an alternative explanation. Evidence to suggest that natural dispersion is rather a slow process, is found in the frequent very irregular distribution of the pest within plantations with apparently fairly uniform environmental features.

The insect may possibly be carried by flood waters as it is tolerant of a certain amount of immersion but the location of most plantations towards the headwaters of streams does not favour this method of dispersal. It may also be spread by other natural agencies, such as birds and wild animals, but the likelihood of this occurrence seems rather remote.

Natural dispersion is of importance in considering the possibility of maintaining a thrips-free plantation in an infested locality. Though exact data is lacking, there is some justification for supposing that the greater

the distance of the plantation from an infested area, and the greater the natural obstacles, e.g., timbered areas and broken country, between the two sites, the better will be the prospects of a plantation remaining free from the pest.

(*b*) *Artificial Means.*—The movement of infested planting material is undoubtedly the most important method of disseminating the pest. By far the greatest part of banana planting material consists of suckers and it is precisely on these suckers where the greatest density of population is found during the summer and where the majority of the insects overwinter. Thus, no matter what the season of the year, suckers from an infested plantation will almost certainly carry a population of thrips, in adult, larval or egg stage. It is possible, too, for soil adhering to suckers to contain the pupal stage. The paring of suckers for banana weevil borer control and the cutting back of the top as far as possible no doubt eliminates a great part of this population but these measures are insufficient to ensure clean planting material.

In the past, planting material was transferred more or less over the whole State to meet the requirements of new areas, and the occurrence of thrips in several localities has been definitely traced to the introduction of suckers from infested areas. Restrictions have for some time been imposed on the movement of planting material and they unquestionably have had, and will continue to have, a beneficial effect in retarding the spread of the pest.

The possibility of transportation in empty packing cases, either with or without packing material, is practically non-existent, owing to the inability of the species to survive for any length of time without food. This point has arisen where banana foliage, which, of course, would be very unlikely to be harbouring thrips, has been used in packing pineapples, and the cases, with the packing material, have been returned to wrong addressees, in different districts.

The carriage of adult and larval thrips on implements, clothing, &c., would naturally be of little importance and seems a very remote possibility, though earth containing pupæ is liable to be moved about with implements.

In considering all methods of dispersal, the inability of the insect to live without frequent access to food and the necessity for the close proximity of a suitable host plant must be emphasised. These two factors place severe limitations on most methods of dispersal of this pest in southern Queensland.

[TO BE CONTINUED.]

PAY WHOM?

"Farming must be made to pay," we were told. In my innocence I thought that this meant that a new and profitable era for farmers was about to begin. Now I learn from a rather cynical correspondent that what was really meant was that farmers would have to pay—more for insurance, fertilizers, stock foods, machinery, and other equipment and material. The real issue is that farming must be made to pay the farmer.—"Blythe," in *The Farmer and Stockbreeder* (England).

Some Observations on the Establishment and Management of Pastures on the Tropical Coast.

A. F. SKINNER, Field Assistant, Agricultural Branch.

Because of the widespread interest taken in the Far-Northern coastal cattle fattening project, the following notes—which are more or less in the nature of a progress report—are published.—Editor.

DURING the past two years wide interest has been focussed on the possibility of fattening beef cattle in the heavy rainfall belt of North Queensland, as it is one of the few places in the world where such a scheme has been attempted under similar climatic conditions.

The high average annual rainfall coupled with high average temperatures promotes very vigorous vegetative growth throughout the greater part of the year, and an abundance of luscious fodder is usually available at times when grasses are scarce in the drier grazing districts of Queensland.

Because of these unusual climatic conditions, much of the work so far has been exploratory, and it is the object of this article to outline those methods of establishing and managing pastures which have, so far, proved to be the most practical and economical.

Chief Pasture Grasses.

It may be said that Para grass* (known also as giant couch, *Panicum muticum,* and "panicum") and molasses grass† are best suited to the climatic conditions peculiar to the wet coastal country of North Queensland. Three major factors which qualify them for these conditions are (*a*) their capacity to make vigorous growth during the wet summer months and consequent ability to compete successfully with other rank vegetative growth; (*b*) their being perennial, a character which present evidence indicates to be essential; (*c*) their habit of forming a complete ground cover.

In the past molasses grass has been sown more generally than Para grass, mainly because of the fact that the former seeds freely and its seed is readily available, whereas Para grass seed of good germinable quality has been difficult to obtain. With a ready market for Para grass seed, greater quantities will be undoubtedly available in the future.

Para grass is favoured for the lower country, while molasses grass usually is preferred for rough or hilly scrub country.

Molasses grass is frequently sown as a mixture with Para grass because, by its quick establishment, it forms a cover and suppresses weed growth while the Para grass, in turn, is becoming established. It

* *Brachiaria mutica* Stapf.

† *Melinis minutiflora* Beauv.

also burns more readily than Para grass, and for this reason it has the advantage of ensuring a good running fire when, after the first year, it again becomes necessary to burn off. Obviously, a good secondary fire consumes much of the fallen timber and rubbish left after the original burn.

Where Para and molasses grasses are sown as a mixture, the former almost invariably takes possession after the second year. Where it is intended to establish an unmixed stand of molasses grass, great care is necessary to guard againt fierce fires, as there is a likelihood of its being destroyed if other than a quick-running fire is permitted. As to the results, much depends on the condition and density of the pastures, also the degree of moisture in the soil at the time of burning. However, as a general practice, caution should always be exercised when burning molasses grass pastures.

Plate 47.
Molasses grass pasture at eighteen months, showing Para grass in foreground. This pasture has been grazed four times.

Para grass shows a rapid change in appearance and rate of growth in accordance with fluctuating weather conditions. On hilly virgin scrub country, molasses grass makes particularly tall, dense, and succulent growth. This is relished by stock, and its fattening qualities are reflected in the condition of the animals.

Grasses suitable for sowing in admixture with Para and molasses grasses are Guinea grass,* purple-topped Guinea grass or *Panicum coloratum*.† Paspalum‡ has been tried throughout the district, but unless frequently renovated, is of little permanent value. Rhodes grass grows readily, but the stock indicate a preference for the other grasses

* *Panicum maximum* Jacq.

† *Panicum maximum* var. *coloratum*.

‡ *Paspalum dilatatum*.

and will not eat the Rhodes grass at all if it is allowed to become tall and rank; also it does not stand the competition of the stronger-growing grasses. Guinea grass is a valuable addition to the pasture, and is sought by stock. During the dry weather of October and November, 1937, it provided much grazing in mixed pastures.

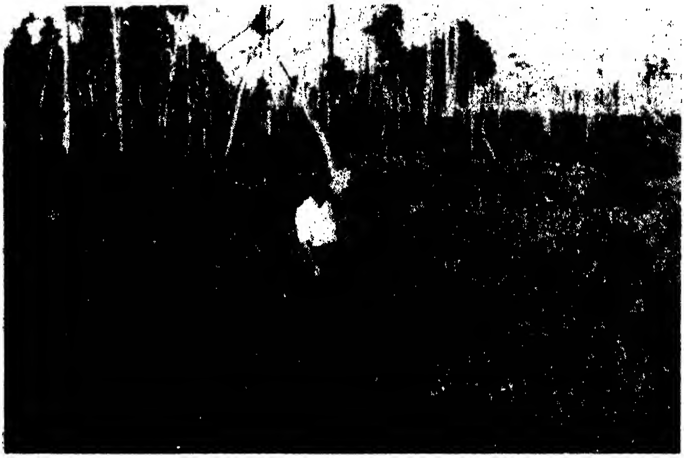


Plate 48.

Para grass pasture showing stools of Guinea grass; established from cuttings after burning off scrub.

Clearing.

Scrub falling is usually commenced in October and completed not later than the first week in December. The work is almost invariably done by contract. Suitable patches of scrub are left for shade and shelter. Where possible, these are located close to water, but above flood level.

Plate 49.

A field of succulent Guinea grass 6 feet high. This grass is a valuable addition to a mixed pasture.

Little time is required for the fallen scrub to dry out sufficiently to permit of a good burn. The time of firing is important, early December being regarded as the most suitable time. If left until later, there is a risk of an early wet season delaying burning and sowing for six months or longer.

Plate 50.

A Herd of Herefords on Para Pastures on Coastal Country.—Well-established Para grass paddocks are capable of heavy stocking.

Sowing.

Where large areas are to be sown to pasture, work is usually commenced in late November or early December. Often sowing is not completed until the middle of January, the work being delayed until the beginning of the wet season to ensure a strike.

Plate 51.

Rotational Grazing is an Important Factor in Successful Pasture Management.—The paddock on the right of the picture shows the growth of grass before grazing; that on the left shows its condition after grazing.

To sow large areas by broadcasting, a gang of men is usually employed to do the work as expeditiously as possible while weather conditions are favourable. It is estimated that each man can cover

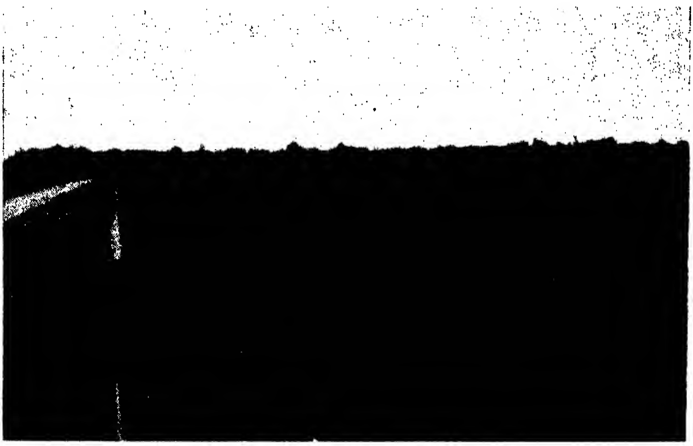


Plate 52.
This area of open country was ploughed and planted with Para grass, but received no further treatment.

3 acres of newly-burnt scrub country in a day. Molasses grass seed is sown at the rate of 2 lb. to the acre, and Para grass seed at 3 to 4 lb. an acre. This amount of seed is thoroughly mixed with a 3-bushel bag of sawdust.

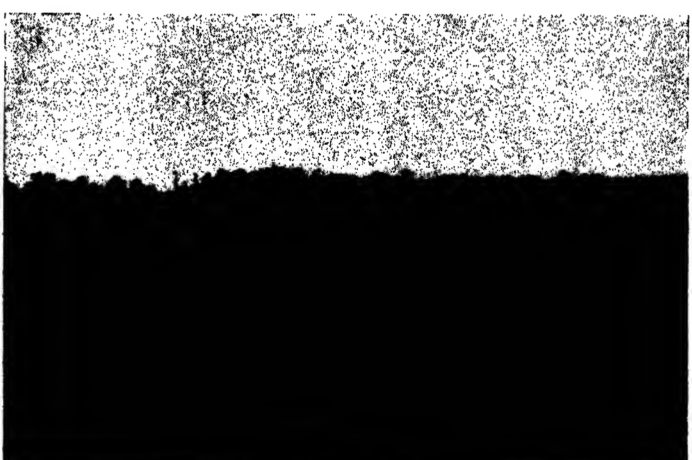


Plate 53.
This paddock of Para grass was planted at the same time as the paddock pictured above (Plate 52), but was disc ploughed twelve months later. Note, for comparison, the intensity of the stand.

Planting.

On newly-burned scrub lands it is a case of sowing seed of Para grass—where seed is available—or planting cuttings by hand. In hand planting, one man digs the holes—one blow from a mattock usually being sufficient for each hole—another follows, dropping the cuttings into the hole as he goes and pulling the sod back over the cutting and pressing it down with his foot. Where it is possible to use a plough, cuttings are dropped along the furrows about 6 feet apart; in this way a quick and close cover is obtained. A second discing about twelve months later has proved a valuable way of intensifying the stand of grass.

Plate 54.

Field of Para grass and Molasses grass immediately after burning to destroy stumps, logs, and undergrowth.

Large-scale planting of Para grass cuttings is now being tested. This method can only be applied, however, to open plain country. It comprises the distribution from a motor truck of Para grass stem material which is lightly covered by means of harrows. The grass is cut by a chaff cutter with only one blade attached. By this means it is chopped into pieces of sufficient length to retain several nodes or joints. The material is distributed from a truck by two men, and is partially covered by harrows drawn behind the truck. Strips of 12 feet are covered in this way, and a considerable area can be planted in a day. The land is ploughed in October and broken down with bumper disc cultivators in November or early December. It is important that planting should coincide with the breaking of the wet season to avoid as far as possible the risk of dry weather after planting. A truck equipped with twin rear wheels and chains is required to prevent sinking on the wet ploughed ground. Under favourable conditions, Para grass cuttings will take root on the surface within several days, and the plants will grow rapidly throughout the wet season. More than one disc ploughing may be necessary, the first being made

about twelve months after planting. A second, probably, would be justified after another two years. In this way, the long runners are cut into many pieces and partially covered. An excellent stand of pure Para grass may thus be established within a few years.

Management of the Pasture.

The initial care taken in establishing either Para grass or molasses grass pasture is of great importance, and is reflected in the life and density of the stand. A close and dense cover is always the primary aim. Once established, such a pasture can stand, apparently, without injury, the heavy grazing which is at times necessary to prevent the development of rank growth.

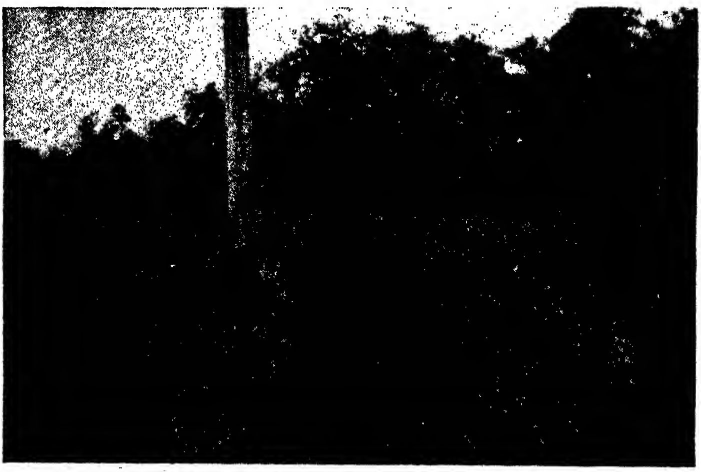


Plate 55.
The same paddock as pictured in plate 54 three weeks later, showing the rapid recovery of the Para grass after a fire.

Following the germination of seed on a new area, it is usual to make a careful inspection and re-sow all bare patches. Early grazing is most injurious to the young pasture, as the young runners are pulled up, with the result that other grasses and weeds often gain an early footing, and may ultimately become a serious invasion of the pasture. Over-stocking during the first twelve months occurs too often. It appears that grazings should be light and brief until a complete cover is obtained and the nodes are firmly rooted in the ground.

To date, the renovation of Para grass and molasses grass pastures has not been attempted. There is little doubt, however, that, where practicable, periodical disc ploughings would prove an excellent way of intensifying the stand. In addition, such a practice probably would tend to sweeten and generally improve the quality of the grass. This work would require to be done shortly before the commencement of the wet season to ensure a rapid recovery.

In view of the low pH values of the soils in some coastal regions of heavy rainfall, it is possible that the application of lime to pasture soils would prove economical. This aspect is at present receiving attention.

Subdivision and Rotational Grazing.

The usual advantages claimed for this phase of pasture management cannot be overrated when the method is applied to the grazing of Para grass and molasses grass pastures. Stock always benefit by a change to fresh pasture, but particularly so during dry weather, when the rate of growth is slow. During the wet season frequent changes are considered necessary to take the maximum advantage of the rapid rate of growth.

Plate 56.
Hereford bullocks approaching their final topping off on Para grass pastures.

Heavy stocking or prolonged grazing during dry weather results in considerable waste of grass through trampling, and recovery is very slow. Molasses grass, particularly, is often injured by trampling, and large patches are sometimes practically killed, permitting the intrusion of weeds and inferior grasses. There is, apparently, less risk of lasting injury from this cause to a well-established sward of Para grass.

Paddocks of from 60 to 100 acres have proved a convenient size for rotational grazing on holdings of approximately 1,000 acres. On smaller holdings, however, it is an advantage to have paddocks of about 30 to 40 acres to obtain a uniform and economical grazing of the pastures.

A THOUGHT.

The effect of cultivation upon the farmer's own mind, and, in reaction through his mind, back upon his business, is, perhaps, quite equal to any of its effects. Every man is proud of what he does *well*; and no man is proud of that he does *not* well.

—*Abraham Lincoln.*

THE WORLD'S MARKET FOR WHEAT.

The Imperial Economic Committee's annual review of "Grain Crops," just published by H.M. Stationery Office (price 2s. 6d. net, 2s. 8d. post free), shows how rapidly conditions in the world market for wheat have changed in recent years.

The world's visible stocks of wheat totalled over 32,000,000 tons at the end of the 1933-34 season. From this peak they had been so much diminished by August, 1937, that the total of 14,250,000 tons was the smallest figure for over ten years. Prices rose sharply in 1936-37 with the fall in supplies, and farmers all over the world sowed an appreciably larger area with wheat for the 1937-38 crop than in the previous season. Though there was not a proportional increase in the world production of wheat (excluding Russia and China), nevertheless the harvest was larger than in any of the three preceding seasons. Consequently, stocks this August are expected to show an increase of some 2,000,000 tons over last year, much of this increase occurring in the United States, where the wheat crop in 1937 was bigger than at any harvest since 1931. Stocks in Canada and Argentina are unlikely to differ much from the totals recorded in August, 1937, for in both countries the last crop was small, as a result of drought and frost damage respectively.

The Imperial Economic Committee's review describes the recent changes in the wheat trade of the principal countries. The United States, having bountiful supplies in the current 1937-38 season, has resumed its old position as a wheat exporter, whereas last season it was importing heavily. The Soviet Union has increased its exports, whilst Australia also has larger supplies available. On the other hand, both Canada and Argentina have only a small exportable surplus. Last season Italy and Germany were large importers. This season Germany has again been importing on a considerable scale. Italy's immediate import requirements were less because of the large harvest reaped in 1937. In some parts of Europe, notably in Italy, the harvest from the 1938 crop is likely to be comparatively small, due to adverse weather this spring; larger imports may therefore be necessary. In the Far East hostilities have curtailed imports.

As to the future position, the review draws attention to the fact that in few parts of the world has there been any indication that the area devoted to wheat for the 1938-39 crop will be substantially reduced as compared with the last sowings. Since last autumn the price of wheat has shown a downward trend, and recently the decline has been rapid, due very largely to the prospect of a bumper harvest in the United States this year. It is too early yet to judge what the final outturn will be, but it seems that the world crop, providing the harvests are normal, may be substantially larger than the demand, even if the European demand is stimulated by government purchases to build up reserves of wheat against possible emergency needs.

The review also covers barley, oats, maize, rye, and rice. It forms a convenient source of information on world cereal production and trade in the years 1930-37, and particularly on the part played by British Empire countries. Special sections deal with the net trading position of the Empire, imports into the United Kingdom, the trend of prices, and on customs duties and import restriction in the chief European importing countries.

THE BRANDING OF STOCK.

The attention of stockowners is directed to the necessity for following the rules of branding, especially in regard to re-branding.

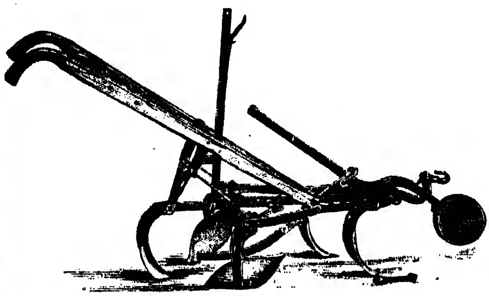
The Brands Act provides that the second or subsequent brander must, if there is room, imprint his brand on his stock at a distance of not less than 1½ inches nor more than 2½ inches from and directly underneath the previous brand.

If there is not room, the re-branding must be done on the next succeeding position, *and on the same side of the animal as the preceding brand in the case of cattle,* thus confining the branding of cattle to one side.

The size of all brands is restricted to not less than 1¼ inches in length, or more than 2½ inches in length for horses and cattle.

Owners are advised to note their obligations in these matters, the observance of which will help to lessen the present unnecessary deterioration of hides through excessive and incorrect branding.

WHILE THEY LAST!



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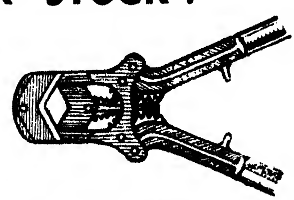

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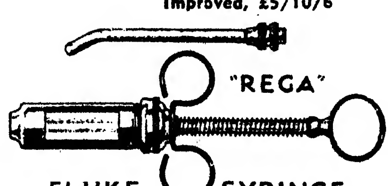

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Milk Grading Tests.

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Research Laboratory.

THE METHYLENE BLUE TEST.

FOR the determination of the hygienic quality of raw milk samples, the Methylene Blue Test (known also as the Methylene Blue Reduction or the Methylene Blue Reductase Test), has been found to be a very useful method of grading. It is of special value where milk from many different sources is received, either for human consumption or for cheese making purposes, for it enables the grader to classify the supplies more accurately than is possible simply by smell and taste. It will not, of course, take the place of the usual regular inspection and grading of the milk, which must always be carried out by a qualified grader on the receiving platform. No amount of description and no scientific test at present known can replace the practical knowledge gained by long experience of grading milk and dairy products, and it is therefore essential to the making of a good grader that he should spend as long a period as possible training under the instruction of an experienced man.

Advantages of the Methylene Blue Test.

1. The Methylene Blue Test carries grading a step further than is possible by judging the aroma and palatability only of the milk.

2. It is a fairly rapid test, taking only a few hours to complete, so that a report or complaint can be made to the farmer when he next delivers milk.

3. The cost is very small, once the necessary apparatus, which is not expensive, has been purchased.

4. It is of great value to the cheesemaker, for a fermentation test can be made on the same samples of milk, showing the type of curd which each will form.

5. Unlike other methods of estimating the amount of contamination in milk, it is easily carried out under factory conditions by a worker with no special technical knowledge. The Plate Count method and the Direct Microscopic Count, by which the numbers of bacteria may be found, both call for skill and special training for their performance, and laboratory facilities are necessary for the former. These tests are used by the bacteriologist when he wishes to discover—

(*a*) The actual numbers of living bacteria present;

(*b*) The types of the bacteria present.

Explanation of the Methylene Blue Test.

The Methylene Blue Test is so called because it depends on the decolourisation of a known quantity of the dye, methylene blue, by the action of bacteria which absorb the dissolved oxygen in the milk at a rate roughly depending on the number present. When the oxygen has been completely used up, the colour disappears, and it is the time taken for this stage to be reached which indicates the extent of bacterial contamination of the milk. The action is hastened by raising the temperature, so that a standard temperature has been fixed at 37 deg. C., and the test is conducted in the dark on account of the methylene blue being slightly affected by light.

Practical Directions for Carrying Out the Test.

A. *Apparatus required.*

1. A water bath, fitted with a lid and test tube racks, capable of maintaining a constant temperature of 37 deg. C. (98 deg. F.)

2. An accurate thermometer.

3. Test tubes (6 in. x ⅝ in.) with a mark at the 10 ml. level. (Plain tubes may be used and the milk measured by means of a 10 ml. pipette. This must, of course, be rinsed in cold and then boiling water between each test, which is tedious, and therefore the pouring method, in which there is no risk of contamination, is to be preferred.)

4. Rubber stoppers to fit test tubes.

5. Standard Methylene Blue Tablets.*

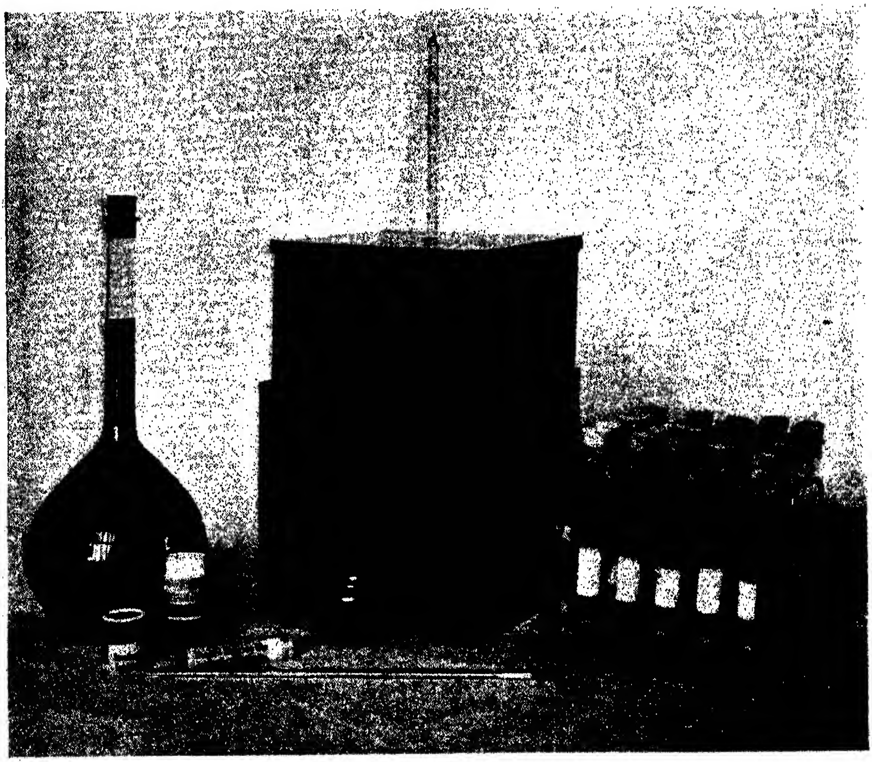

Plate 57.
Apparatus needed for carrying out the Methylene Blue Test in the factory, using a kerosene lamp.

6. A 1-ml. pipette for measuring Methylene Blue solution.

7. An 800-ml. measuring flask for use in making up the Methylene Blue solution, and a rubber stopper to fit.

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* The names of firms supplying apparatus and Standard Methylene Blue tablets will be supplied on application to the Department of Agriculture and Stock, Brisbane.

B. *Factory Sterilisation of Water and Apparatus.*

Distilled or tank water, for making up the standard solution, may be sterilised by boiling for five to ten minutes and allowing to cool in the same vessel.

Measuring flask, test tubes, corks, and pipette may be sterilised in a steam chest or by boiling in water for five to ten minutes. The tubes should be placed upright in their rack and filled to the brim with clean water, before immersion for boiling. The corks may be tied in a piece of clean muslin. The apparatus should be sterilised immediately before use, and allowed to drain dry.

C. *Making up the Standard Solution.*

It is essential that Standard Methylene Blue Tablets be used in carrying out the test. These are prepared by certain firms only and are sold in packets containing twenty tablets (sufficient for 16,000 tests).

Dissolve one tablet in about 200 ml. of cold sterile distilled water in the 800-ml. measuring flask, by shaking, then fill up to the mark.

This stock solution, when corked and stored in the dark, will keep for periods up to two months. It should not be used after this.

D. *Regulation of Water Bath.*

The water bath should be filled some time before the proposed commencement of the test, with water at about 37 deg. C. The temperature should be checked several times at intervals to make sure that it will remain steady at 37°C. during the test.

The level of water outside should be above or equal to that of the milk inside the tubes.

E. *Sampling.*

Samples should be as far as possible the same age at testing, so that separate morning's and evening's milk samples are advisable rather than one sample of mixed milk.

As with all bacteriological samples, special precautions must be taken to exclude contamination. If sample bottles and corks or screw-tops are used, they must be sterilised by heat prior to use. Care must then be taken not to handle the mouth of the bottle or to touch any part of the cork other than the top ¼ inch, and the bottles must not be opened until just before filling and must be closed immediately afterwards.

A composite sample is taken to include a proportional amount of milk from each can received. This may best be done with a cream sampler of the long-handled saucer type, with which the stirring and sampling may be carried out in one operation and the milk placed in a sterile bottle. Alternatively, the cans may be stirred with a plunger, and a small dipper used to extract the sample. This makes it possible to place a proportion of milk direct in the sterile test tube.

Two samplers (or dippers and plungers) should be available. They must be sterilised for two minutes or more in a jet of live steam, or for ten minutes in boiling water, before use. They can then be used for alternate samples, one set being rinsed thoroughly in cold water then in boiling water, while milk is taken with the second set.

Sampling direct from the weighing vat is not satisfactory for milk intended for bacteriological tests.

F. *Method of Testing.*

When all samples have been taken, each is shaken thoroughly and a 10-ml. quantity is poured into a sterile test tube, or, if bottles are not used, this quantity is poured direct from the dipper. To this is added 1 ml. of Standard Methylene Blue solution, and the tube corked with a previously boiled rubber cork. The test tube is then gently inverted two or three times to mix, and placed in the covered constant-temperature water bath at 37 deg. C. (98 deg. F.). After thirty minutes the tubes are removed for inspection, and each is inverted once to distribute the cream, and replaced in the water bath. This is done every half-hour. Any samples which have decolourised entirely, or to within 5 millimetres (one-fifth of an inch) of the surface, are removed and the time noted. This is the end of the test.

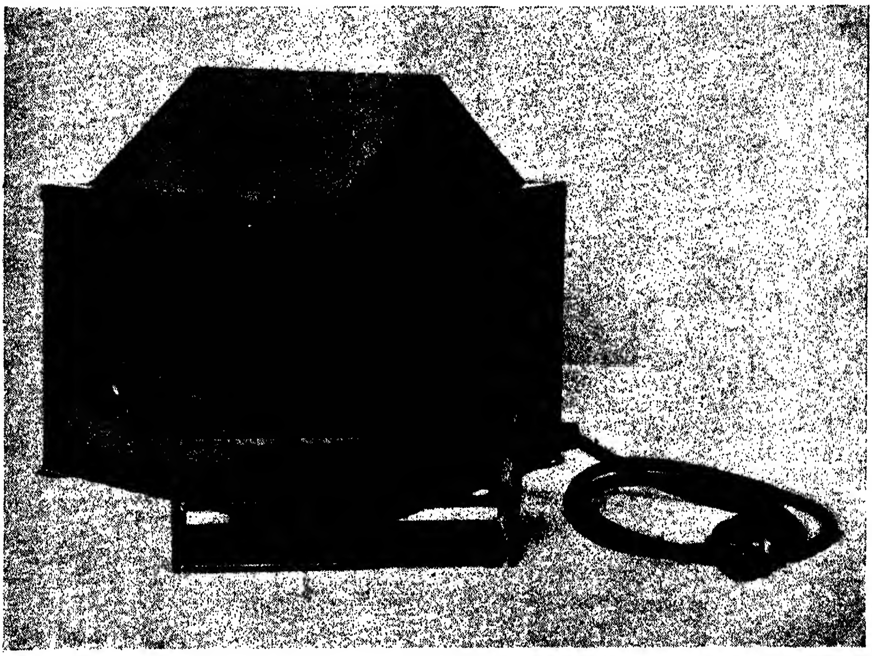


Plate 58.
Electrically-heated and controlled Methylene Blue Test Water Bath for Laboratory use, showing one test-tube rack.

Interpretation of Reduction Times.

A slow reduction time indicates comparatively little bacterial activity and therefore a cleanly produced and handled milk. Rapid bleaching indicates large numbers of bacteria and lack of care in production, with a consequent shortened keeping quality.

Thus it is possible to divide the supplies into three or four classes, similar to those given below:—

Time taken to decolourise.	*Grade of milk.*
30 minutes or less	Bad
30 minutes to 2 hours	Poor
2 to 5 hours	Fair
Over 5 hours	Good

No hard-and-fast rule can be laid down, but after some experience with the test the grader is able to set a standard to which most of the supplies in his locality will conform. Attention can then be given to improving those which fall below the highest grade.

Here again, in interpreting the results, the grader must take into consideration the age of the milks being tested. Evening's milk, which may be twelve to fifteen hours old before it is tested, is not to be compared with the morning supply, which is perhaps two to five hours old.

In milk sampled and tested only a short time after being produced, the natural bactericidal property common to all freshly-drawn milk will still be active and will assist in lengthening the reduction time, by preventing, to some extent, the multiplication of the bacteria. This resistance disappears after a few hours, and there is then a rapid rise in numbers and activity.

Regular testing of each supplier's milk should be carried out. Twice-monthly samples, taken without warning to the farmer beforehand, tested over several months, will give a good idea of the average quality of each.

The Methylene Blue Test has been used largely in Scandinavian countries and in America for grading milk. It was adopted in England in January, 1937, to replace the Plate Count as the official method of testing all Accredited milk to be sold for human consumption. It is less suitable for use with pasteurised milk owing to a number of factors, but for comparative grading of raw milk it is a cheap, reliable method which can be of assistance to the factory in eliminating the undesirable milk and selecting the best, and to the whole industry by stimulating the production of milk under better hygienic conditions, which forms the basis of a higher standard in dairy products. It is too often forgotten that consistently high-quality butter and cheese, as well as liquid milk, cannot be produced unless the original milk supply is also of good quality, and that a low-grade supply will bring down the standard, not only of any milk with which it may be mixed, but also of the resulting product.

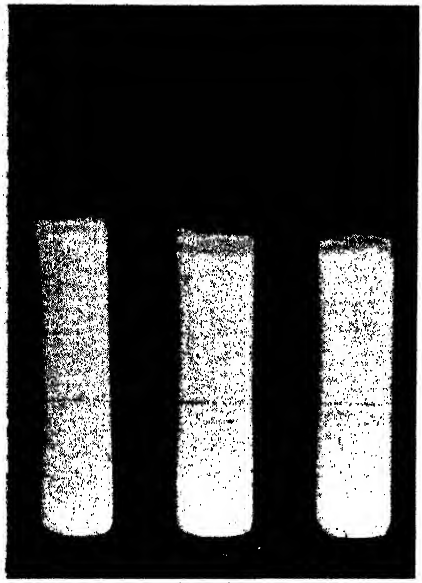
FERMENTATION TEST.

If a fermentation test is to be conducted, the tubes are replaced in the water bath after noting the reduction time, and allowed to remain overnight at 37 deg. C. The milk will have coagulated by next morning, and the plug of curd may be inspected for smoothness, freedom from gas-holes, undesirable aromas and wheying off. A good milk for cheese-making purposes will show a clean, smooth curd with a pleasant acid smell, while the presence of peptonisation or of gassiness indicates unclean production conditions, with the possibility of tainted and gassy cheese.

The types of curds most commonly met with (See Plate 59) may be classified according to the kind of bacteria predominating:—

Gelatinous.—Even smooth curd without gas bubbles: due to desirable lactic acid types.

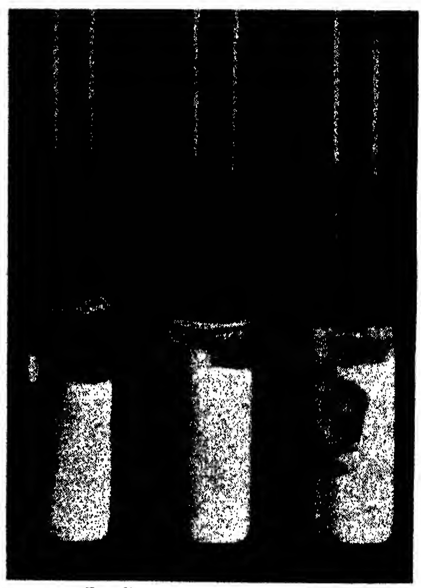
Blown.—Gassy with curd collected towards the surface, and whey beneath: due to undesirable acid and gas-producing types, coliform organisms.



A. Gelatinous.

B. Blown.

C. Spongy.



D. Cheesy or Peptonized.

Plate 59.

COMMON TYPES OF CURD OBTAINED IN THE FERMENTATION TEST.

Spongy.—Gassy, with fine bubbles distributed throughout curd, little or no separation of whey: milk containing few desirable lactic acid types and gas-forming organisms predominating.

Cheesy or Peptonised.—Solid curd, with clean separation of whey: due to the presence of bacteria secreting rennet, not to acid-producing types.

This test may, of course, be carried out quite separately from the Methylene Blue Test, in which case the milks should be judged after twelve, twenty, and twenty-four hours.

In actual practice distinction is only made between the very objectionable blown and gassy types and the other classes, but the fermentation test is an additional aid to the cheesemaker in grading his milk supplies, and in selecting the milks having clean lactic acid rather than those showing other changes.

[TO BE CONTINUED.]

THE STRAINING OF MILK.

On the most carefully managed farm, a certain amount of visible dirt finds its way into the milk. The term "visible dirt" covers such matter as dust, cow hairs, flies, and manure, as distinguished from bacteria, which are not visible to the naked eye. Bacteria may be present in milk which appears perfectly clean, fresh, and pure—and their presence may not be realised until souring begins several hours after contamination. If visible dirt is present in the milk, however, bacteria will be there also, hence the necessity for straining through a suitable strainer. The cotton wool disc type prescribed by the Dairy Regulations is preferable to any other. It can only be used once, and there is no risk of contaminating fresh supplies of milk, as sometimes happens with a cloth strainer which has not been properly washed and boiled.

It is better to keep visible dirt out of the milk than to strain it out. Early straining is better than last-minute straining, for the longer dirt is allowed to remain in the milk the greater will be the number of organisms passing into the liquid. The progress may be understood more clearly by a rough analogy with making a brew of tea. If the tea leaves are removed soon after the addition of the hot water, the tea remains weak. If they are stirred in the teapot, or left for any length of time, the brew becomes much stronger. Similarly, if dust and dirt are left in the milk, undesirable bacteria, with which every particle of dirt is teeming, pass into the milk and increase the tendency to early scouring and bacterial taints.

The milk from each cow should be removed immediately milking is completed and tipped through the straining disc into the can or better still direct into the receiving tank above the cooler. It will not require a second or even a third straining, for one straining, together with proper cooling, will be sufficient to lengthen the life of the milk and help to give it a satisfactory keeping quality.

—*M. J. Griffiths.*

A Plant Poisonous to Sheep.*

R. E. CHURCHWARD, B.V.Sc., Government Veterinary Surgeon, and
E. H. GURNEY, A.A.C.I., Agricultural Chemist.

IN cases where mortalities in sheep have occurred and plant poisoning is suspected, it is the practice of stockowners and field officers of the Department of Agriculture and Stock to collect and forward to the Government Botanist specimens of the plants growing in the paddocks in which the mortalities took place. On a number of occasions the plant, *Andrachne decaisnei*, has been included. A collection of plants from a certain railway trucking reserve where frequent mortalities in mobs of resting sheep had occurred was found to include *Andrachne decaisnei.* The matter was brought before the Poison Plants Committee† of the Department of Agriculture and Stock and the Committee decided that as the plant was known to contain a poisonous principle (prussic-acid-yielding glucoside) it was desirable to undertake chemical and feeding tests with the plant in order to determine the quantity of the poisonous principle present and how far, if at all, the amount varied with different periods in the plant's growth.

Botanical Description.

Andrachne decaisnei is a native plant 9 to 15 inches high, inclined to be woody in its older stages. It is generally much branched and the branches and leaves are clothed with fine hairs. The leaves are $\frac{1}{3}$ to $\frac{3}{4}$ inch long. The flowers are very inconspicuous and are soon followed by seed pods, which are borne in great abundance. These are like a small flat pea about $\frac{1}{6}$ inch diameter, and are thinly clothed with fine hairs. The seed capsules when ripe burst into three pods each containing two seeds; these latter being triangular in shape, straight on the sides and curved on the back. Both back and sides of the seeds are strongly wrinkled. No common or local name for the plant has been recorded.

Experience of Field Officers.

On 17th March, 1938, Mr. C. C. Barth, District Inspector of Stock, Longreach, reported that he visited a shed where shearing was in progress. On 16th March a number of shorn sheep had been turned into a small paddock for a few hours prior to being moved into a larger paddock. This small paddock adjoined the shearing-shed, and contained only *Andrachne decaisnei*, all the other herbage having been previously eaten. On the following day the owner of the shorn sheep found eight ewes dead, and Mr. Barth was of the opinion that *Andrachne decaisnei* appeared to be responsible for their deaths, though possibly this was from effects associated with the shearing of the animals. He also stated that probably the sheep were hungry and ate a quantity of the plant which, under normal conditions, they appear to avoid.

Mr. Barth subsequently reported that he had observed, later in the season, a small paddock which contained about 4 acres of *A. decaisnei* without any other form of vegetation. A number of shorn sheep were

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* *Andrachne decaisnei.*

† A committee established by the Department of Agriculture and Stock as the result of a grant from the Australian Wool Board for the purpose of conducting investigations into plants suspected of being toxic to sheep.

turned into this paddock and within two days the sheep had eaten all the plant. No mortalities occurred in this flock and Mr. Barth, in view of his previous observations on the plant, stated that the plant appears to vary in toxicity.

Mr. Bambrick, Inspector of Stock, Hughenden, has advised that from his observations it would appear that as *A. decaisnei* grows it gradually loses its toxicity. When young it is toxic to any class of stock but after maturing it is only sufficiently toxic to cause death to hungry stock. The leaves of mature plants, eaten in conjunction with other feed by paddock stock cause no ill-effects. When eaten by hungry travelling stock, at any stage of growth, in even small quantities, it will cause death.

Chemical Analyses.

In order to ascertain whether any variation occurred in the amount of the poisonous principle (prussic acid or HCN) given off by the plant when eaten—as suggested by the observations of field officers—arrangements were made for supplies of the plant, at different stages of growth, to be forwarded to the Agricultural Chemist for analyses.

A supply of the plant collected on the 17th March by Mr. Barth at Longreach was analysed and showed that younger plants gave 86·3 mgms. HCN per 100 grams moisture-free plant, while older material gave 63·3 mgms. HCN per 100 grams moisture-free plant. These analyses proved that both plant samples contained, at this time of the year, enough of the poisonous principle to cause mortalities in stock if eaten freely.

A second sample of the plant collected on the 25th June, again by Mr. Barth, was analysed. The younger plants gave 38 mgms. HCN per 100 grams moisture-free plant, fully matured plants (old plants with some seeds fallen, some of the plants green and others dry) gave 17·3 mgms., and mature plants before reaching the drying-off stage gave 22·1 mgms.

These chemical analyses support the observations of field officers in regard to decrease in toxicity of the plant as it matures.

Feeding Tests and Drenching Experiments.*

First Test.—The initial feeding trial with the plant was commenced in April with material supplied by Stock Inspector Bambrick, of Hughenden. Two sheep (Sheep Nos. 8 and 14) had already been starved for twenty-four hours when the material arrived.

Sheep No. 8.—On the 13th April this sheep was force fed ½ lb. of the chaffed plant (leaves, fruit, and finer portions of the stem). On 14th April, the animal appeared normal and was then drenched with 750 ml. of a watery extract of the chaffed plant. This extract was prepared by soaking 1 lb. of the plant in 1 litre of water overnight and expressing the fluid through a plant press.

One hour after drenching the animal became uneasy and sudden contractions of the diaphragm and various groups of muscles were noticed. The animal had trouble in maintaining balance, especially behind, and its hind legs were set well apart in an effort to stand.

* These experiments were carried out at the Animal Health Station, Oonoonba, Townsville, by Mr. R. E. Churchward, B.V.Sc., Government Veterinary Surgeon.

Plate 60.
A Plant Poisonous to Sheep (*Andrachne decaisnei*).
(For description, see page 183.)

Breathing and pulse rate were accelerated with the former laboured. After an hour and a-half the animal was unable to stand and sat down "dog fashion" and finally collapsed on to its side. Convulsive movements were frequent and the animal was greatly distressed. After two hours the eyes became bloodshot and it appeared as though death would shortly occur. Later, spasms became less frequent and breathing approached normal. After five hours the animal was able to rise with help and maintained an upright position though somewhat unsteadily.

Sheep No. 14.—On 13th April this sheep was offered chaffed plant but did not consume it. On 14th April the animal was force fed ¾ lb. of the chaffed plant. This animal showed no ill-effects from the feeding

Both Sheep No. 8 and No. 14 were kept under observation for a further five days but neither exhibited any ill-effects.

Second Test.—This test was carried out with further material submitted from the same district as the material used in the first test, but the sample on this occasion appeared somewhat more mature and in a fresher condition. It was noticed that on removal from the container there was a strong odour such as one finds with plants containing a high percentage of HCN (prussic acid).

Sheep No. 3.—On the same day as the plant was received this sheep (approximately 100 lb. live-weight) was force fed with the chaffed plant. Before the feeding had finished the animal was showing signs of discomfort and for this reason feeding was discontinued when less than 1 lb. had been taken. The animal soon exhibited symptoms as seen in Sheep No. 8 and within fifty minutes of the beginning of feeding the animal died.

Post-mortem of Sheep No. 3.—A post-mortem was carried out immediately, with the following observations:—

Much gas formation in the first stomach (paunch) with evidence of prussic acid poisoning in certain tissues and abnormal appearance in certain blood vessels. The fourth or true stomach was slightly congested. The intestines appeared normal but there was slight congestion of the kidneys and lungs. Plant was found in first stomach only. About 20 mls. of fluid was drained from the heart sac. The heart was very dark in colour and there was evidence of hæmorrhage in the heart muscle.

Picrate test for HCN:—

First stomach contents gave a strong (++) test.

Fresh plant gave a very strong (+++) test.

Goats.—1,000 grams (approximately 2 lb.) of the chaffed plant was soaked in 1 litre of water overnight. A male goat was drenched with ½ litre of the fluid pressed out of this mixture and died within thirty minutes, showing symptoms similar to those exhibited by Sheep No. 8 and No. 3.

DESCRIPTION OF PLATE 60.

***Andrachne decaesnei*, Benth.**

A. Shoot, natural size.

B. Seed capsule with perianth leaves at base x 6.

C. Seed capsule with perianth leaves viewed from top x 6.

D. Seed enlarged x 20.

Post-mortem Examination.—The examination showed abnormalities varying little from those exhibited by Sheep No. 8. The fluid in the fourth stomach gave a positive test for HCN by the picrate method.

A female goat was force fed 150 grams (roughly 5½ oz.) of the chaffed plant but except for a slight unsteadiness of movement, together with laboured breathing, the animal remained normal.

Prevention of Cases of Poisoning.

In view of the dangerous nature of the plant stockowners, and particularly drovers, should make themselves familiar with it in order that sheep, especially hungry animals, can be prevented from gaining access to young growth of the plant.

It should be remembered that even the mature plant is dangerous for hungry sheep.

Conclusions.

1. *Andrachne decaisnei* contains a prussic-acid-yielding glucoside.

2. This varies with the stage of growth of the plant. Plants are most dangerous when young, becoming less harmful, except for hungry sheep, when mature—i.e., showing seed pods.

3. Sheep and goats fed about 1 lb. of the plant for every 100 lb. of live-weight die showing typical prussic-acid poisoning symptoms.

4. Post-mortem examinations confirm the supposition that death was due to poisoning by prussic acid.

Acknowledgments.

These experiments were made possible by a grant from the Australian Wool Board to the Department of Agriculture and Stock for the purpose of conducting investigations into plants suspected of being toxic to sheep. The assistance of the Wool Board is greatly appreciated by the Department.

It also is desired to acknowledge the assistance of officers of the Department who contributed to this work.

WINTER-GROWING RHODES GRASS MAY CAUSE STOCK LOSSES.

Although warnings that the so-called winter-growing or frost-resistant Rhodes grass is a potential source of danger to grazing stock have previously been issued, some farmers may not yet be aware that this grass should be grazed with caution. Winter-growing Rhodes grass should not be confused with the more common Rhodes grass which makes a very valuable pasture.

The prussic acid content of winter-growing Rhodes grass has been determined in samples collected both in Queensland and in New South Wales, and the quantity found was sufficient to indicate that the grass may sometimes be toxic to animals. Little is known about the conditions under which stock losses due to ingestion of the grass may occur, and stockowners are advised to be very careful when paddocks of the grass are being grazed.

In districts where high-yielding winter-growing grasses and clovers can be grown, the use of the winter-growing Rhodes grass for grazing purposes is not recommended.

—*C. W. Winders.*

Mosaic Disease of Sugar Cane.*

C. W. LEECE.

MOSAIC disease is one of the most widely spread diseases of sugar-cane in the world, and is one with which canegrowers in Central and Southern Queensland should be familiar. It is, however, a disease which has never received quite the full amount of attention that it deserves from farmers, and consequently it is possible that the losses resulting from it in Queensland are under estimated. In view of its widespread distribution in this State and the cultivation of many susceptible varieties it is desirable that farmers should have an adequate knowledge of the disease, and thus be in position to initiate any necessary control measures.

In many countries overseas, mosaic disease constitutes a major problem and very heavy losses have been recorded. In Puerto Rico in 1920, the sugar industry was threatened with extinction in consequence of the ravages of the disease. The same position arose in Louisiana in the Southern United States about five years later. In the Argentine, the West Indies, and in other countries strict control measures have had to be applied in order to avoid serious losses. In Louisiana the existence of different strains of the disease has been recognised, and a variety resistant to one strain may be susceptible to another, and may vary again in its reaction to a third. It is difficult to say just in which manner these strains arise, and cane breeders in Louisiana have been faced with the problem of breeding varieties resistant to all strains as part of the campaign to control the disease.

In Queensland, mosaic disease is very rarely seen in the wet tropical areas north of Townsville. Infection is, however, distributed throughout the Proserpine, Mackay, Bundaberg, and more southern districts, the most severely affected areas being foothill country and river flats, where secondary spread of the disease is rapid.

Mosaic is a virus disease, as is Fiji disease. The characteristic symptoms exhibited by an infected cane take the form of a mottling of the leaves, due to the formation of pale areas of irregular outline, with the long axis of these areas lying parallel to the midrib of the leaf. They may sometimes approximate to oval shape, but are never sufficiently well defined to allow any other term than "irregular" to be applied. They are distributed all over the leaves, and are usually yellowish-green in colour, but may vary from creamy white to pale green, and are seen in contrast to the normal green of the leaf. Variation in colour and shape of the pale areas depends on the particular variety affected and on other factors. The greatest contrast between light and dark areas is noticed on the youngest leaves, the older leaves having a tendency to become uniform in colour again. There is no marked tendency towards streaking, although large chlorotic areas sometimes run together and give a streaking effect. Because of this apparent streaking mosaic disease was originally termed "yellow stripe" disease, but the latter name was subsequently abandoned on account of the fact that the streaked effect was by no means always a characteristic. Symptoms are usually exhibited by all leaves attached to one particular stalk, and the number of obviously diseased stalks in a stool varies from one to all.

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1938.

The accompanying illustration shows two diseased leaves, one young and the other an older leaf borne on the same stalk of E.K. 28.

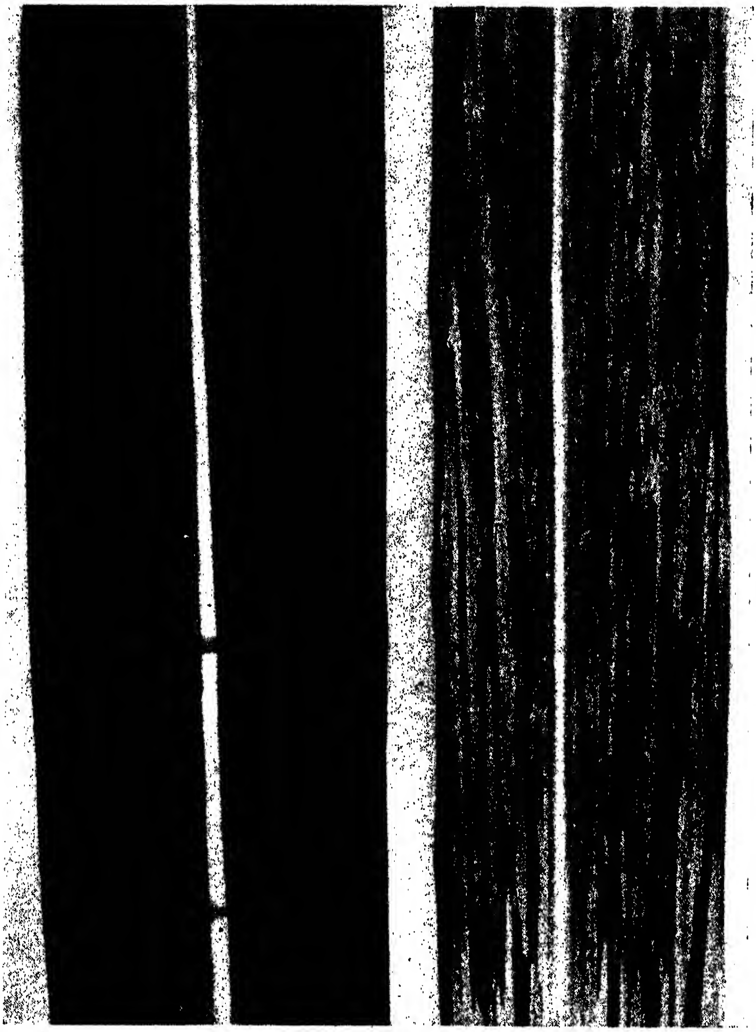


Plate 61.

Mosaic disease. Leaves of sugar-cane variety E.K. 28 bearing the typical mottling produced by mosaic disease. On the right is a young leaf, and on the left an older leaf, both taken from the same cane stalk.

The effects of the disease vary with the variety, as some varieties are more susceptible than others. If a healthy, growing, cane becomes infected, there may be little diminution in growth, as in the case of P.O.J. 36; on the other hand, if Q. 813 contracts the disease there will be a very marked stunting. In the ratoon crop there will certainly be marked stunting and poor stooling if the variety is by any means susceptible; the stalk will be shorter and thinner, and fewer stalks will be produced in a stool. A mottling similar in pattern to that on the leaves may appear on the rind, and small cankers of various types may

also be present. If a diseased sett is planted a stunted stool results, and this never regains normal vigour. Resistance to adverse conditions such as prolonged dry weather is lowered, and death of the stool may result.

The most susceptible varieties are 1900 Seedling, Clarke's Seedling, M. 189 (Black Innes), E.K. 28, B. 208, and D. 1135. P.O.J. 213 and P.O.J. 234 both contract the disease very readily, but are less sensitive than the firstnamed varieties, and losses are not so great. Badila and Oramboo are also susceptible. Resistant varieties are P.O.J. 2714, P.O.J. 2725, and P.O.J. 2878.

So far, the effect of mosaic on Co. 290 has varied according to locality. A fair amount of infection has been observed in one part of the Mackay area, but the variety appears to be tolerant elsewhere. The existence of different strains of the disease in Louisiana has been mentioned, and it is possible that new strains are beginning to develop in Queensland. It is therefore very desirable that every effort be made to control the disease before any new strains become dominant, and thus add to the complexity of the problem.

The disease is infectious, and is transmitted from plant to plant by the corn aphis, *Aphis maidis*, a small dark insect. This insect is not normally a feeder on cane, and never breeds on it. It is, however, the chief means of transmitting the disease. Experimentalists have succeeded in inducing mechanical infection by placing a diseased leaf above a healthy one and pricking both leaves simultaneously with a needle. A piece of stem tissue taken from a diseased cane has also been used to infect a healthy cane by making a hole in the latter and inserting therein the diseased tissue. Another worker has obtained diseased stools by cutting healthy cane with a knife which has previously been used to cut diseased cane. However, mechanical transmission need not worry the farmer, whose chief concern is the control of the corn aphis.

The corn aphis is most common during the summer and autumn, and it is then that most natural transmission will take place. Since young canes are more easily infected than older ones, the young spring plant cane is in a condition favourable for contracting the disease just at the time when the aphis is most plentiful.

Mosaic disease is not confined to sugar-cane. Maize, sorghum, Sudan grass, and certain other grasses, both wild and cultivated, are also liable to contract the disease, and thus act as a source of infection for canefields. Moreover, the corn plant is a natural breeding ground for the insect, and it is therefore inadvisable to have corn and cane growing in close proximity to each other.

Since losses due to mosaic disease may be of considerable importance if the disease is allowed to remain unchecked, the farmer is recommended to utilise the following methods of control:—

(1) Make regular inspections of fields, following these by digging out diseased stools.

(2) Select planting material carefully, using only those plants taken from disease-free stools.

(3) Keep all headlands and fields as clean as possible, and free from weeds and grasses, which are also liable to harbour the disease and the corn aphis, which spreads it.

(4) Avoid the cultivation of maize and sorghum. If it is necessary to cultivate these crops isolate the blocks as much as possible. The corn aphis is unable to breed on sugar-cane but multiplies very rapidly on the maize plant.

(5) Carry out planting operations in the autumn where practicable, rather than in the spring. The corn aphis is most common during the summer and autumn, and the young spring plant cane constitutes ideal material for infection.

(6) Cultivate resistant varieties if other control measures fail to keep the present varieties reasonably free from disease.

CANE SAMPLES FOR TEST PURPOSES AT EXPERIMENT STATIONS.

Attention has been drawn on several occasions to the conditions which must be observed by canegrowers desirous of having cane sample tests made by our Experiment Stations, for the purpose of determining the state of maturity of their crops, and thus giving an indication of the sequence in which respective blocks should be harvested.

Each sample shall consist of six stalks or 20 lb. of cane, whichever is the greater. Samples of burnt cane will not be accepted in any circumstances. When samples are forwarded over the railway, freights must be paid. By special arrangement with the Railway Department, test canes are consigned at a flat rate of 1s. per bundle. Where facilities for prepayment of freight are not provided, the grower should reimburse the Experiment Station by forwarding 1s. in postage stamps, enclosed in a brief letter advising that the canes have gone forward.

It should not be necessary to point out that the results of our Station tests are never intended for use in checking mill returns; for this purpose they are quite misleading and worthless.

H.W.K. in *The Cane Growers' Quarterly Bulletin*.

NEED FOR LIME ON ACID SOILS.

It is evident that many canegrowers still fail to grasp the necessity for applying adequate dressings of lime to those lands which are intensely acid. Under these conditions, the benefits of artificial manures will not be obtained until the acids have been neutralized or "killed" by lime.

We are forcibly reminded of this by the results of nine soil samples submitted to our laboratory recently by the Instructor in Cane Culture at Innisfail. Each was taken from a field where crop growth was poor, and in all cases our tests showed that the soils were in need of heavy applications of lime. In many instances the plantfood supply of the land was quite fair, but the acid condition of the soil dominated the growing conditions.

Canegrowers in the heavy rainfall areas—from Mossman to Ingham—and notably those farming other than red volcanic soil, should communicate with their local Instructor in Cane Culture for the purpose of having tests made: or a sample representative of each block to 10 in. depth may be sent, to the Director, Bureau of Sugar Experiment Stations, Brisbane. This service is given free of charge.

H.W.K. in *The Cane Growers' Quarterly Bulletin*.

Downy Mildew Disease.*

A. F. BELL.

DOWNY mildew, together with Fiji disease, constitutes the chief menace to the cultivation of the high-yielding P.O.J. canes. It is a very destructive disease and cane farmers who grow P.O.J. canes, B.147 or B.208, should always be on the watch for it.

Plate 62.

Downy Mildew.—Leaves of cane plants affected with this disease bear well-defined, long, yellow stripes; occasionally the leaves may be completely yellowish. On the under surface of diseased leaves may be borne (especially in wet weather) a powdery white fungus or "mildew." This figure illustrates the leaf stripes while the appearance of the mildew (magnified) is illustrated in the inset.

The early symptoms of downy mildew consist in the production of long yellowish stripes on the leaves and hence the name "leaf stripe" has often been applied to this disease. Stripes vary in width, from fine lines up to about ¼ inch, but individual stripes are uniform

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1938.

in width. Later the stripes turn reddish and the leaves die prematurely. On the under surface of such leaves will be found a white powdery "mildew." These stripes and the mildew are illustrated in Plate 62.

Sometimes, and especially in young cane, the whole top may be yellowish. The white mildew may not always be found on the leaves and, indeed, may be difficult to find in the dry winter and early spring months.

During the winter a certain proportion of the diseased stalks suddenly elongate and grow up a couple of feet above their neighbours. These stalks are usually thin, soft, and brittle. Kanakas used to call this stage of the disease "jump-up" disease. They stand out like flags pointing to the presence of the disease.

The white mildew consists of countless numbers of the spores or "seeds" of the fungus which causes the disease. These spores fall on the eyes or buds of adjacent canes and, in wet weather, they may germinate and infect these buds. Naturally the plant will not appear infected until the fungus has grown up through the stalk and into the leaves. It very often happens therefore that certain buds of a cane stalk may be diseased, although the top appears healthy. It will be readily understood then that it is impossible to be certain of selecting healthy plants when there is a diseased stool in the vicinity.

Downy mildew spreads but slowly, if at all, during the cool dry months of winter and early spring. Obviously then the time to effect a "clean-up" on a farm is in the young plant and ratoon cane, before the rains commence.

The following methods are advocated for the control of downy mildew:—

1. Inspect cane and carefully examine any stools or shoots which appear stunted or yellowish or which bear yellow leaf stripes.

2. If there is any doubt as to the disease report the matter to the nearest Experiment Station or Field Officer.

3. Do not take plants from within 200 yards of the nearest known disease. Inspect not only the field from which it is proposed to take plants but also adjacent fields.

4. Inspect autumn plant cane immediately and spring plant and ratoon cane as soon as it is knee high. Dig out and destroy any diseased stools as soon as they are observed. Continue inspections as long as possible.

5. Do not plant susceptible varieties near a known diseased field.

6. Exercise particular care with P.O.J. 2878, P.O.J. 2714, P.O.J. 213, B.208 and B.147, but most varieties will take this disease if exposed to heavy infection. The variety P.O.J. 2725 is resistant.

Special Fertilizer Mixtures for Sugar Cane.*

H. W. KERR.

THE number of possible fertilizer mixtures which could be manufactured is without limit; and, indeed, the number of mixtures actually marketed in Queensland to-day is so great that the farmer can only become confused by the range and selection available.

Some four years ago, this situation was reviewed for the benefit of canegrowers, and a small selection of mixtures was made, with the object of framing all future recommendations on this basis exclusively. Only two plantfood materials—phosphate and potash—were considered in this respect. It was felt that applications of the third plantfood—nitrogen—could well be regarded as a separate factor, to be introduced as required. It was therefore possible to restrict the mixtures to three, which contained—

No. 1.—High phosphate, low potash.

No. 2.—Medium phosphate, medium potash.

No. 3.—Low phosphate, high potash.

By applying a suitable dressing of the appropriate mixture, the farmer could provide his plant cane with its full requirements of phosphate and potash in one application. The need for nitrogen for the plant crop would be governed by such considerations as whether a green manure crop had been ploughed under during the preceding fallow, or whether it was a "plough-out and replant." Such treatment would take the form of top-dressings of sulphate of ammonia, applied to the crop when the land was free of weeds, and the roots of the young crop were ready to absorb it without delay. This is generally in the spring of the year.

TABLE I†.—Composition of Sugar Bureau Fertilizer Mixtures.

Mixture.	Nitrogen.		Phosphoric Acid.		Potash (as muriate).
	As sulphate of ammonia.	As bone and offal	As super.	As bone and offal.	
	%	%	%	%	%
No. 1 Planting	..	1·0	13·0	4·0	7·5
No. 1 Ratooning	3·0	1·25	9·5	3·5	6·25
No. 2 Planting	..	1·25	9·0	3·75	15·0
No. 2 Ratooning	3·0	1·25	7·0	3·75	12·5
No. 3 Planting	..	1·75	2·5	5·5	25·0
No. 3 Ratooning	3·0	1·5	2·0	4·5	22·5

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1938.

†It should be pointed out that these analyses represent the *actual* composition of the mixtures as prepared by reputable fertilizer companies. The guarantee printed on the bag labels may, however, show figures slightly lower than those of this table. The explanation lies in the fact that such companies are protecting themselves in the (unlikely) event of a particular batch of mixture not measuring up to the full standard as set out, which would render them liable to prosecution under the Fertilisers Act.

Now ratoon crops are always in greater need of nitrogen than plant cane, irrespective of the area or the farming rotation followed. It was therefore considered desirable to devise "ratooning" mixtures corresponding to the "planting" mixtures already discussed; the main difference then between No. 1 plant and ratooning mixtures, for example, would be the addition of sufficient sulphate of ammonia to supply 3 per cent. of nitrogen, to give a rapid start to the young ratoon crop.

We have, then, six actual mixtures in the Sugar Bureau series, and the respective compositions are shown in Table I.

It should be stressed that these mixtures provide for the requirements of even the most discriminating canegrower, and nothing is to be gained by going outside this range. Furthermore, as all Bureau recommendations, following soil analyses, are made on the basis of these mixtures, the canegrower would be well advised to "get the habit" of adopting the Sugar Bureau mixture best suited for his soil. It will be either No. 1, No. 2, or No. 3—using the planting mixture for plant cane, and the ratooning mixture for ratoons.

The best index to the precise needs of any soil type is an analysis of the soil from the particular field; and growers are again urged to take advantage of this assistance, for which there is no special charge. Indeed, the Instructor in Cane Culture will take the samples and despatch them, on request. In the absence of this information, however, the farmer may accept the following general recommendations, on the broad basis of soil type:—

No. 1 *Mixtures.*—Generally suitable for lands deficient in phosphates. Such are the alluvials and forest soils of most areas.

No. 2 *Mixtures.*—Suitable for those lands generally deficient in both phosphate and potash. The red schist soils of North Queensland, or alluvial and forest lands on which meatworks fertilizer only has been used, are examples of this class.

No. 3 *Mixtures.*—These are specially compounded for use on soils showing marked potash deficiency. The red volcanic loams of all cane areas are the best examples of this class.

As a very general recommendation, these mixtures should be applied at the rate of 4-5 cwt. per acre. For poor soils (sandy loams, &c.) the dressing might be increased to 6 or 8 cwt. per acre, while on the rich alluvials of the Burdekin area, 3 cwt. per acre would suffice.

It should be noted carefully that, except for a small proportion in the ratooning mixtures, this series supplies virtually no nitrogen to the cane. It is now well recognised that nitrogen is generally the plant-food most seriously lacking in Queensland cane soils. The farmer must therefore utilise sulphate of ammonia in addition to these mixtures, to provide a "balanced" treatment.

Except where green manuring has been practised before planting, plant cane will usually benefit from a top-dressing of sulphate of ammonia at the rate of 2-3 cwt. per acre. Ratoons will always demand more nitrogen than plant cane, and such crops should invariably be top-dressed with sulphate of ammonia. Usually 3-4 cwt. per acre is sufficient, applied in two dressings; ratoons under irrigated conditions may, however, require up to 5 cwt. per acre.

P.O.J. 2878 in Southern Queensland—Can it be Retained?*

ARTHUR F. BELL.

IN addressing you as head of the Division of Entomology and Pathology, I am thankful to be able to say that the damage caused by insect pests in the Bundaberg district remains very slight. A slightly increased amount of damage, due to the Childers cane grub, has appeared with the extension of two-year cropping. Mr. Mungomery, who has had a great deal of experience with this pest, paid a visit to the Bundaberg-Isis district during February and March. He recommends that grub-infested ratoons should not be stood over, and strongly deprecates the practice of "plough-out and replant." In particular he commends for your consideration the more widespread use of high-speed rotary hoes. These implements, used in the summer months, when the grubs are near the surface of the ground, effect a large-scale reduction in grub populations and allow subsequently planted cane to get off to a clean start which should be maintained through to the second ratoon crop.

When we come to the subject of diseases, however, it is a different story. This district has suffered so much from the effects of sugar-cane diseases in the immediate past that it is absolutely astounding to note the apathy displayed by some farmers towards Fiji and downy mildew diseases. On the other hand it is very gratifying to know that your elected representatives are fully alive to the dangers of the present disease situation, and we would like to place on record our great appreciation of the interest shown and the assistance rendered by your District Executive and the Secretary, Mr. Wheeler.

There should be no need for me to point out the good qualities of P.O.J. 2878; you have all seen thousands of acres in this district and know what a great part it has played in helping you out of the slough of despair in which, some ten years ago, the industry in this district was sunk.

Probably most farmers know that P.O.J. 2878 contains one-eighth "wild blood"; that is to say its great grandfather was a so-called wild cane, a thin, hardy, strong rooting and strong stooling cane which contains no sugar whatever. It is from this great grandparent that P.O.J. 2878 has inherited its vigorous growth, strong rooting system, strong ratooning, upright habit, drought resistance, ability to stand over, and also its resistance to gumming and mosaic diseases. However, we know from the bitter school of experience that there is no rose without its accompanying thorn, and in this case the catch lies in the fact that P.O.J. 2878 is highly susceptible to Fiji and downy mildew diseases. But it must be emphasised, and re-emphasised, that at this stage of development of these two diseases in the Bundaberg district it would be an easy matter to control both diseases completely, *provided a little care is constantly exercised by all sections of the cane-growing community.*

*** Address delivered at the Farmers' Field Day, Bundaberg Sugar Experiment Station, 29th June, 1938.**

We have here, displayed for your inspection, specimens of both Fiji and downy mildew diseases, and I would urge you to take advantage of this opportunity of putting yourselves into the position of being able to recognize these diseases when you see them. But even if a farmer is not able to recognize them I think all will admit that in any case, when confronted in the field with stools such as these, he must know that *something* is wrong with the cane.

Now as to the control of these diseases. Both are spread almost entirely during the summer and autumn months, Fiji disease by the sap-sucking sugar-cane leaf hopper, and downy mildew by means of fungus spores or "seeds" which are borne on the under-surface of diseased leaves, and which blow or splash on to healthy canes. In the case of Fiji disease, the leaf hoppers are very numerous in the summer and early autumn, but die out and become very scarce in the winter and spring; consequently there is very little spread during the latter period. The leaf-hopper, passing from a diseased to a healthy plant, infects it by injecting diseased sap, but it takes weeks and sometimes many months before the disease shows up. In the case of downy mildew the spores of the fungus are produced in greatest numbers during warm, moist weather. Healthy plants become infected through the spores falling upon the young buds in the stalk and germinating and growing into the bud; again it may be months before the disease becomes apparent.

The likelihood of a long period elapsing before symptoms show up in diseased plants makes plant selection very difficult, and to be safe no cane should be used for plants if growing within a quarter of a mile of a single stool affected with either disease. You will now appreciate the dangers which attach to getting plants off another farm, and we cannot sufficiently condemn the practice of buying plants from the four points of the compass. In the first instance both these diseases are spread from district to district, and to a great extent from farm to farm, by the use of infected planting material. Therefore, farmers should plan as far as possible to grow their own plants, in special plots if need be, but, if it is absolutely necessary to get plants from an outside source, then the assistance of Bureau officers should be called in.

The second point in control is that farmers should carefully inspect their young plant and ratoon cane and dig out and destroy any suspicious stools. If this practice is conscientiously followed by every farmer, then both Fiji and downy mildew diseases can be kept down to insignificant proportions and P.O.J. 2878 saved for the future. But this work must be done at the right time and not postponed until January or February.

Where fields of mature cane are already infected they should be burnt before harvesting and *cut early*. When cane becomes infected during growth it may take some time for the disease to penetrate down to the roots, and therefore the sooner the cane is cut the more likely are the ratoons to come away healthy.

Particular care should be taken in the inspections of ratoons when the previous crop was known to be diseased, but, if infection is above, say, one-half per cent. the cane should be ploughed out without further question.

P.O.J. 2878 is highly susceptible to both these diseases. P.O.J. 213 and Co. 290 are both highly resistant to Fiji disease, but both, and

especially P.O.J. 213, are susceptible to downy mildew. Therefore, if P.O.J. 2878 is allowed to become infected with downy mildew it will menace these two varieties also.

We sincerely trust that no farmer will be deluded into thinking that we are making a great deal of fuss about a little matter. We have already been forced to prohibit the growth of P.O.J. 2878 in the Lower Burdekin and Mackay districts on account of downy mildew, and we have also prohibited its growth in the Maryborough and Beenleigh districts on account of Fiji disease. Thus it will be seen that its further cultivation in the Bundaberg district is menaced on two counts.

I have just returned from a visit to the Richmond River district of New South Wales. Ten years ago this district was in the same position as Bundaberg, the sugar industry being in a very parlous condition as a result of the ravages of gumming disease. In the last few years, due entirely to the introduction of P.O.J. 2878, the situation has been completely transformed and the district has moved to prosperity and record crops. Unfortunately, Fiji disease had been in the district for many years and, at the time of the introduction of P.O.J. 2878, was rather more widespread than it is in Bundaberg at the present time (but not worse than the situation will be in Bundaberg in a year or two if adequate steps are not taken). As a result the retreat has now commenced, and already the planting of P.O.J. 2878 has had to be abandoned in certain areas and less attractive varieties substituted. Realising the outstanding value of P.O.J. 2878, the Colonial Sugar Refining Company is making strenuous efforts to save this cane, but of course the success of the campaign, there as here, will depend upon the vigilance of the farmers.

It is a very serious problem which confronts you, gentlemen. We, for our part, are collecting and trying out all available disease resistant canes, but we have nothing in sight which could adequately replace P.O.J. 2878—and even if we had such a variety, it would necessarily be some years before it could be planted to the large areas now occupied by P.O.J. 2878. The job in hand calls for action right now, and, if you have not already done so, I trust that you will all commence a careful inspection of your autumn plant cane to-morrow morning.

A New Service to Pig Breeders.

THE provision of a service for valuing and reporting on the carcase quality of particular pigs nominated by producers, has resulted from the efforts of the Queensland Pig Industry Committee, which is representative of the Commonwealth and State Governments, pig producers, and the managements of bacon curing and pork exporting firms.

The introduction of this scheme paves the way for pig breeders who are striving to produce desirable pigs securing definite guidance by receiving reports on the carcases of particular pigs; and the discussions which frequently occur between producers and agents at time of trucking, regarding the merits of particular pigs, could be put to good use if a report was obtained on the carcase quality of the pigs under discussion.

To provide such a service, it has been agreed that on the request of the supplier, and upon payment by him of a fee of 2s. 6d. to the firm purchasing his pigs, any pig nominated and suitably identified by the supplier, will be appraised after slaughter and reported on by a Government officer.

The report will be forwarded direct to the Department of Agriculture and Stock, who will analyse and comment on the details of the report and forward it to the supplier of the pig. The charge of 2s. 6d. per pig by the firm who has purchased the pig from the producer, or who is treating it on his behalf, is compensation for loss occasioned in cutting up the side for appraisal purposes.

The use of this service by pig breeders should help considerably towards solving many problems of the industry, and it should be of special value in enabling producers to more confidently recognise desirable conformation and condition in live baconer and porker pigs. To stud breeders this scheme should prove a valuable aid in demonstrating definitely the good features, and deficiencies, in their particular families and breeds of pigs, which are distributed to form the basis of commercial herds.

The standard method of pig carcase appraisal to be used is that provided by the British authorities, as published in the "Pig Breeders' Annual" for 1936-37, and now adopted by the Australian Meat Board. This method, which is described in the following pages, provides a standard for comparison which is based as far as practicable on measurements and facts, rather than on individual opinion; pig raisers can, therefore, have every confidence in the reports issued on their pigs, when this method of appraisal is used.

The following form of report gives the scale of points used.

Report on carcase of pig consigned by ....

.... to..

Date of slaughter ....

Weight of carcase..............................lb. Brand of carcase..............................

—	Possible Marks.	Standard Measurements in millimetres* for carcase of this weight.	Actual Measurements in millimetres.	Marks Obtained.	Percentage of Possible Marks.
(*a*) (By Inspection).					
Colour—clean, fresh, white	5	..	..	..	..
Skin—smooth and fine ..	5	..	..	..	..
Hams—well-filled and fine boned	8	..	..	..	..
Shoulders—light	7	..	..	..	..
Fat—firm and white ..	10	..	..	..	..
Streak—thick, full of lean meat	12	..	..	..	..
(*b*) (By Measurement).					
Body length in proportion to weight	20	..	..	..	..
Leg length—short.. ..	5	..	..	..	..
Backfat thickness — correct proportion	20	..	..	..	..
"Eye muscle" of loin—thick	28	..	..	..	..

*Measurements are taken in millimetres rather than in inches to avoid fractions. (25 millimetres = 1 inch.)

Remarks.

Conclusions.

Method of Appraisal.

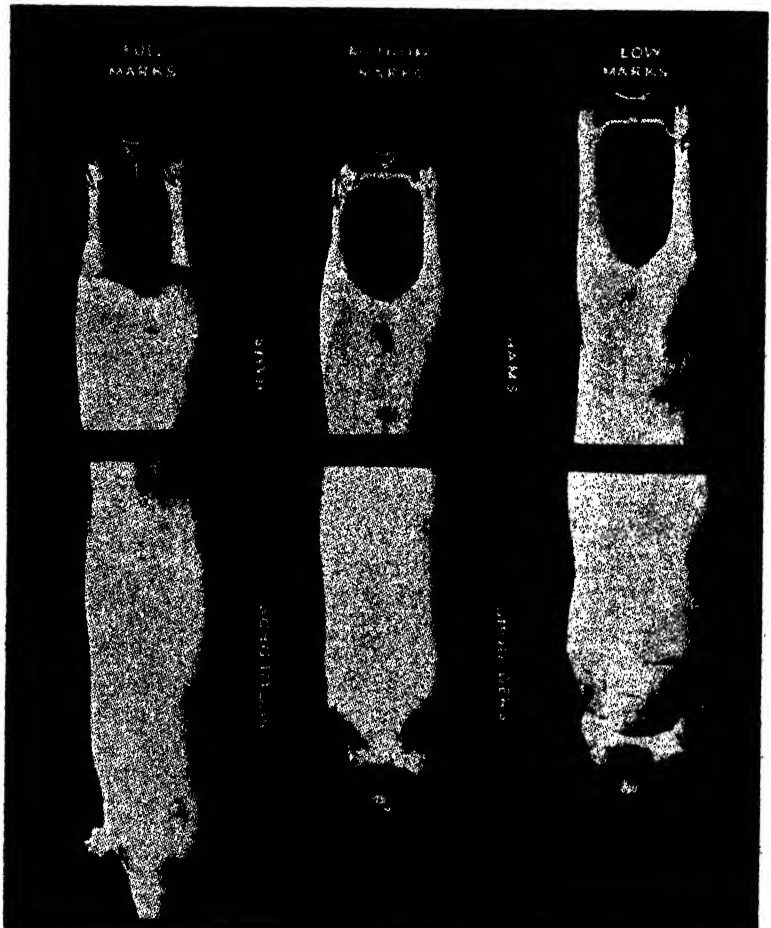
The carcase is first weighed, as all values for measurements are based on the weight of the carcase.

The skin is then examined for colour and texture. The colour, for which a maximum of 5 points is allotted, should be a clean, fresh and white one. The skin should be smooth, and not too thick or coarse; 5 points are allotted for this feature.

The examiner then stands behind the carcase and values the hams in comparison with the photographic standards illustrated in Plate 63, which show the ideal hams, which receive 8 marks, the worst hams, which receive 1 mark, and medium hams, which receive 4 marks. Good hams should have fine leg bone, and be well filled out with lean meat, being U-shaped rather than V-shaped between the legs.

JUDGING BY EYE APPRAISAL.

STANDARDS FOR AWARD OF MARKS.



[*Produced for New Zealand Evaluation Committee by Jas. B. Swain. Reproduced by courtesy of "The Pig Breeders' Annual,"* 1936-37.

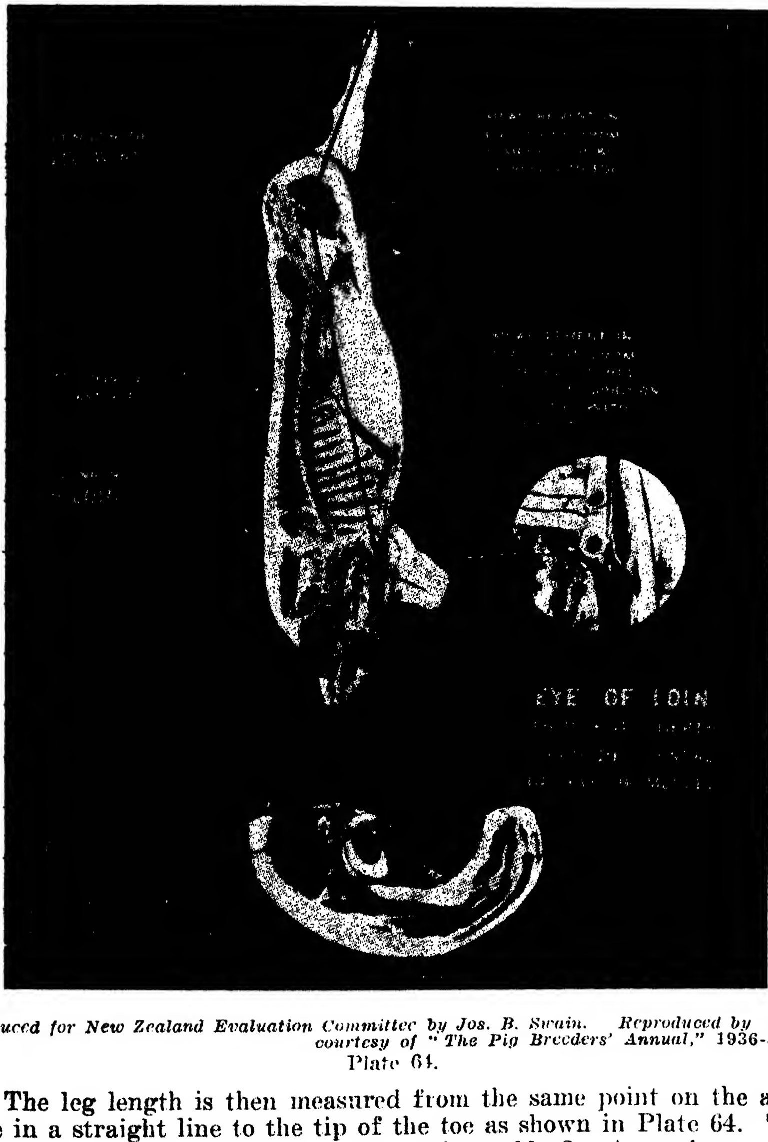
Plate 63.

The shoulders are similarly valued, using the photographic standards illustrated in Plate 63, the maximum marks being 7, minimum 1, and intermediate 4. The shoulders should be comparatively light.

At this stage the carcase is split down the middle line into two sides.

Then using a tape measure graduated in millimetres, the body length is measured from the edge of the symphysis pubis bone (aitch bone) in a direct line to the junction of the sternum (breast bone) with the first rib (see Plate 64). This is an important feature of the carcase and so a maximum of 20 points is allotted. As body length can only be valued in relation to the carcase weight, reference must be made to table 1, and the measurements converted into marks according to the weight of the carcase.

JUDGING BY AWARD OF MARKS FROM MEASUREMENT.



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain. Reproduced by courtesy of "The Pig Breeders' Annual," 1936-37.*

Plate 64.

The leg length is then measured from the same point on the aitch bone in a straight line to the tip of the toe as shown in Plate 64. This measurement is converted into marks using table 2. A maximum of 5 points is allotted for leg length, which should be as short as possible, as it gives an indication of the proportion of bone throughout the carcase.

TABLE I.

MARKS FOR BODY LENGTH (SYMPHYSIS PUBIS TO FIRST RIB). Measurements in mm.

Carcase Weight lb.	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to 109	110 to 114	115 to 119	120 to 124	125 to 129	130 to 134	135 to 139	140 to 144	145 to 149	150 to 154	155 to 159	160 to 164	165 to 169	170 to 174	175 to 179	180 to 184	185 to 189	190 to 194	195 to 199
Marks																												
1	550	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820
2	555	565	575	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825
3	560	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830
4	565	575	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835
5	570	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840
6	575	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845
7	580	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850
8	585	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855
9	590	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860
10	595	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865
11	600	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870
12	605	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875
13	610	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880
14	615	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885
15	620	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890
16	625	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895
17	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900
18	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895	905
19	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900	910
20	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895	905	915

TABLE II.

MARKS FOR LEG LENGTH (SYMPHYSIS PUBIS TO TOE). Measurement in mms.

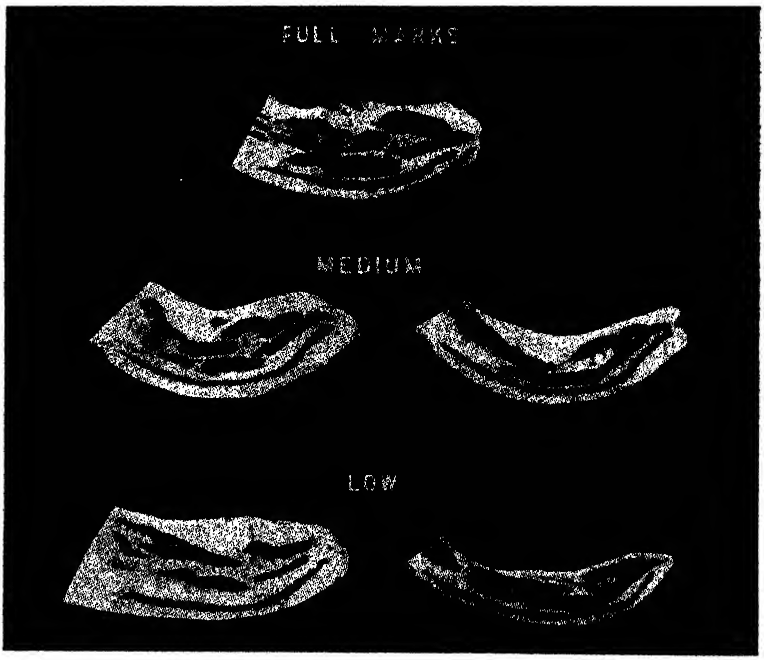
Carcase Weight lb.	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 94	95 to 99	100 to 104	105 to 109	110 to 114	115 to 119	120 to 124	125 to 129	130 to 134	135 to 139	140 to 144	145 to 149	150 to 154	155 to 159	160 to 164	165 to 169	170 to 174	175 to 179	180 to 184	185 to 189	190 to 194	195 to 199
Marks		and over																										
1	450	460	470	480	490	500	510	520	530	540	550	560	570	575	580	585	590	595	600	605	610	615	620	625	630	635	640	645
2	449 to 440	459 to 450	469 to 460	479 to 470	489 to 480	499 to 490	509 to 500	519 to 510	529 to 520	539 to 530	549 to 540	559 to 550	569 to 560	574 to 565	579 to 570	584 to 575	589 to 580	594 to 585	599 to 590	604 to 595	609 to 600	614 to 605	619 to 610	624 to 615	629 to 620	634 to 625	639 to 630	644 to 635
3	439 to 430	449 to 440	459 to 450	469 to 460	479 to 470	489 to 480	499 to 490	509 to 500	519 to 510	529 to 520	539 to 530	549 to 540	559 to 550	564 to 555	569 to 560	574 to 565	579 to 570	584 to 575	589 to 580	594 to 585	599 to 590	604 to 595	609 to 600	614 to 605	619 to 610	624 to 615	629 to 620	634 to 625
4	429 to 420	439 to 430	449 to 440	459 to 450	469 to 460	479 to 470	489 to 480	499 to 490	509 to 500	519 to 510	529 to 520	539 to 530	549 to 540	554 to 545	559 to 550	564 to 555	569 to 560	574 to 565	579 to 570	584 to 575	589 to 580	594 to 585	599 to 590	604 to 595	609 to 600	614 to 605	619 to 610	624 to 615
5	419	429	439	449	459	469	479	489	499	509	519	529	539	544	549	554	559	564	569	574	579	584	589	594	599	604	609	614
		and under																										

One side is now cut across, straight, at the level of the last rib, and the hind part laid with the cut surface to the examiner. The backfat is now measured, in the case of porkers 1 inch and with baconers 1½ inches from the middle line, using callipers, with one point on the edge of the "eye muscle" and the other point on the inner layer of the skin (see Plate 64). By referring the backfat measurement to table 3 the measurement can be converted to marks, and it will be found that the possible of 20 marks is provided for an optimum measurement in accordance with the weight of the carcase; marks are lost for excessive fat or insufficient fat.

STANDARDS FOR AWARD OF MARKS.

BY EYE APPRAISAL.

STREAK (BACONER).



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain. Reproduced by courtesy of "The Pig Breeders' Annual," 1936-37.*

Plate 65.

The "eye muscle" of the loin is then measured with callipers halfway along its width as illustrated in Plate 64. Table 4 is provided for converting the measurement into marks, and this measure of the proportion of lean meat in the carcase is the most important feature, being allotted a possible of 28 marks.

The backfat should now be valued for firmness by rubbing the thumb across it. The most desirable fat is hard (not oily) to the touch. In colour the fat should be a clean white.

TABLE III.

MARKS FOR THICKNESS OF FAT OVER LOIN.

Measurements in mms.

Carcase wt., lb.	60 to 69	70 to 79	80 to 89	90 to 99	100 to 109	110 to 119	120 to 129	130 to 139	140 to 149	150 to 159	160 to 169	170 to 179	180 to 189	190 to 199
Marks														
1	1	1	2	3	4	5	7	8	9	10	11	12	13	14
4	..	2	3	4	5	6	8	9	10	11	12	13	14	15
7	2	3	4	5	6	7	9	10	11	12	13	14	15	16
10	3	4	5	6	7	8	10	11	12	13	14	15	16	17
12	4	5	6	7	8	9	11	12	13	14	15	16	17	18
14	5	6	7	8	9	10	12	13	14	15	16	17	18	19
15	..	..	..	..	..	..	..	14	15	16	17	18	19	20
16	6	7	8	9	10	11	13	15	16	17	18	19	20	21
17	..	..	..	..	..	..	14	16	17	18	19	20	21	22
18	7	8	9	10	11	12	15	17	18	19	20	21	22	23
19	8	9	10	11	12	13	16	18	19	20	21	22	23	24
20	9	10	11	12	13	14	17	19	20	21	22	23	24	25
19	10	11	12	13	14	15	18	20	21	22	23	24	25	26
18	11	12	13	14	15	16	19	21	22	23	24	25	26	27
17	..	..	..	..	..	..	20	22	23	24	25	26	27	28
16	12	13	14	15	16	17	21	23	24	25	26	27	28	29
14	13	14	15	16	17	18	22	24	25	26	27	28	29	30
12	14	15	16	17	18	19	23	25	26	27	28	29	30	31
10	15	16	17	18	19	20	24	26	27	28	29	30	31	32
7	16	17	18	19	20	21	25	27	28	29	30	31	32	33
4	17	18	19	20	21	22	26	28	29	30	31	32	33	34
1	18	19	20	21	22	23	27	29	30	31	32	33	34	35

TABLE IV.

MARKS FOR THICKNESS OF EYE MUSCLE OF LOIN.

Measurements in millimetres.

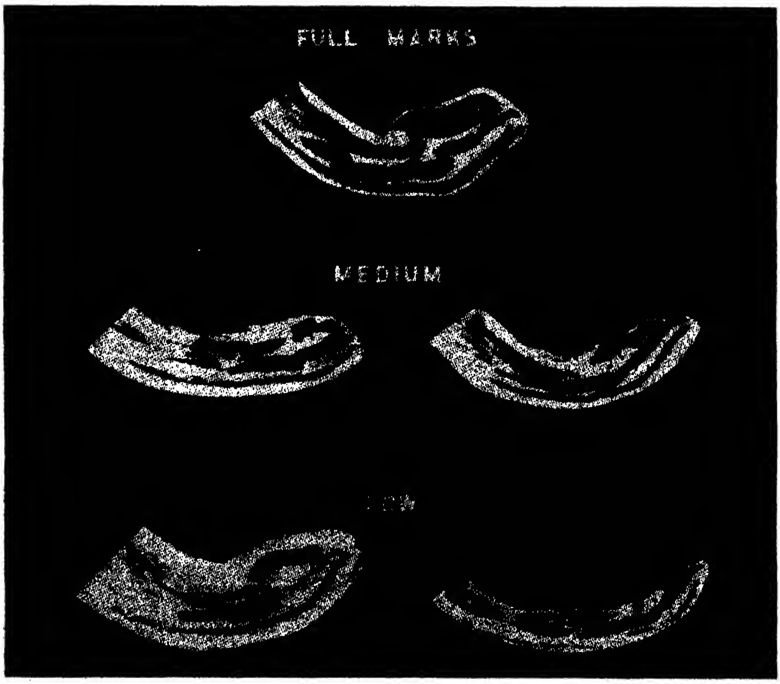
Carcase wt., lb.	60 to 64	65 to 69	70 to 74	75 to 79	80 to 84	85 to 89	90 to 99	100 to 109	110 to 119	120 to 139	140 to 159	160 to 179	180 to 199
Marks													
1	23	24	25	26	27	28	29	30	31	32	33	34	35
3	24	25	26	27	28	29	30	31	32	33	34	35	36
5	25	26	27	28	29	30	31	32	33	34	35	36	37
7	26	27	28	29	30	31	32	33	34	35	36	37	38
9	27	28	29	30	31	32	33	34	35	36	37	38	39
11	28	29	30	31	32	33	34	35	36	37	38	39	40
13	29	30	31	32	33	34	35	36	37	38	39	40	41
14	30	31	32	33	34	35	36	37	38	39	40	41	42
15	31	32	33	34	35	36	37	38	39	40	41	42	43
16	32	33	34	35	36	37	38	39	40	41	42	43	44
17	33	34	35	36	37	38	39	40	41	42	43	44	45
18	34	35	36	37	38	39	40	41	42	43	44	45	46
19	35	36	37	38	39	40	41	42	43	44	45	46	47
20	36	37	38	39	40	41	42	43	44	45	46	47	48
21	37	38	39	40	41	42	43	44	45	46	47	48	49
22	38	39	40	41	42	43	44	45	46	47	48	49	50
23	39	40	41	42	43	44	45	46	47	48	49	50	51
24	40	41	42	43	44	45	46	47	48	49	50	51	52
25	41	42	43	44	45	46	47	48	49	50	51	52	53
26	42	43	44	45	46	47	48	49	50	51	52	53	54
27	43	44	45	46	47	48	49	50	51	52	53	54	55
28	44	45	46	47	48	49	50	51	52	53	54	55	56

The streak or belly as shown in the section of the side is valued by inspection and comparison with the photographic standards for baconers and porkers, illustrated in Plates 65 and 66 respectively. The streak or belly should be thick and it should also contain a high proportion of lean meat. Maximum marks (12) are given for a streak which is both thick and full of lean meat. A minimum mark (1) is given for either thin streaks or those which have a high proportion of fat. Streaks of medium value receiving 6 marks are also illustrated.

STANDARDS FOR AWARD OF MARKS.

BY EYE APPRAISAL.

STREAK (PORKER).



[*Produced for New Zealand Evaluation Committee by Jos. B. Swain. Reproduced by courtesy of "The Pig Breeders' Annual,"* 1936-37.

Plate 66.

All the illustrations and tables used herein are taken from "A Method of Judging Pork and Bacon Carcases," Pig Breeders' Annual, 1936-37.

SWEET POTATOES AND ARROWROOT FOR PIGS.

With the approach of spring, farmers are planning their cropping programmes, and so the time is opportune for considering the value of such root crops as sweet potatoes and arrowroot as pig foods. These two crops are well known to most coastal pig farmers and can be grown in most places where there is a sufficient rainfall and a long summer season.

Under similar conditions, the yield of pig feed per acre from arrowroot and sweet potatoes is several times that from maize grain. This fact alone makes these crops worthy of consideration, but they also have the advantage of being more or less drought-resistant and are usually freer from pests. In the case of sweet potatoes, some growers claim that they are worth growing for the vines alone. The vines of the sweet potatoes and the stalks and leaves of the arrowroot provide a large quantity of succulent green food.

If it is necessary to harvest and feed these crops by hand, the labour involved is considerable; but both crops can be fed off by pigs, and where the paddocks are made pig-proof, and some temporary fencing is used to partition off a small portion of the crop for the pigs to harvest, excellent results are obtained. If pigs are allowed to run over the whole crop a good deal of waste results. They should, therefore, be confined on an area which they can clean up in about one week.

Arrowroot is frequently boiled before being fed to pigs; but, although the boiling does increase its nutritive value somewhat, it is doubtful whether the increase warrants the labour required to dig, cart, and boil the bulbs, especially when it has been demonstrated that pigs do remarkably well by harvesting the crop for themselves.

Sweet potatoes and arrowroot are not complete foods in themselves, and must be fed in combination with foods rich in protein, such as separated milk or meatmeal. The more extensive use of these two crops, in conjunction with the separated milk at present available, would enable coastal dairy farmers to increase their output of pigs greatly, and this is very desirable to the pig industry at present.

—*L. A. Downey.*

PIG BREEDERS' ANNUAL.

The eighteenth volume of the Pig Breeders' Annual (1938-39) has just been issued by the National Pig Breeders' Association.

The Pig Breeders' Annual is the only publication of its kind in the world. Although issued by a breed society, it is far from being breed propaganda; in fact, it comprises a survey of the latest developments in breeding, feeding, and management, and is therefore of interest to all concerned in pig production at home or overseas.

The President, Major-General Sir Wyndham Knight, K.C.I.E., contributes the foreword.

The subjects dealt with include "The Management of a Breeding Herd," by Mr. S. H. Hart (a Past-President of the N.P.B.A.); "The Progress of Danish Pig Breeding," by Dr. Clausen; "Mortality in Pig Production," by Mr. A. W. Menzies Kitchin, Cambridge School of Agriculture; "The Experiences in Judging Pig Carcasses," by Mr. H. R. Davidson; "Tethering System of Pig Breeding," by Mr. R. B. Peacock, of Cambridge; "The Grocer's View of Pig Production;" "Costs—a Breeder's Experiences"; and a "Review of the Australian Show System," by E. J. Shelton. Dr. K. A. H. Murray, of the Agricultural Economics Research Institute, Oxford, contributes a comprehensive "Survey of the Pig Industry in 1937," and the regular features—perhaps the most interesting and valuable section of this annual publication—include summaries of research and experimental work carried out during the past year, and notes on the progress of the pig industries in the principal pig-producing countries of the world. An enlarged statistical section, with pig-feeding tables, is also included, and the whole volume (270 pages, illustrated and attractively bound) represents remarkably good value. The cost, including postage, is 3s., from the National Pig Breeders' Association, Victoria House, Southampton Row, London, W.C. 1.

Sheep Grazing and Lamb Raising Trials at Mackay.*

D. L. McBRYDE and H. W. KERR.

Introduction.

MANY of the Mackay lands have been reduced to a low state of fertility due to continuous cropping to cane over a long period of years, without due attention to the conservation of humus and soil plantfoods generally. So long as cane cultivation is continued as the only form of agriculture, the costly and slow process of fertility building by means of substantial fertilizer applications, combined with the growth of an occasional green manure crop, is the only method at the command of the farmer.

The average cane yield per acre for the district is one of the lowest in Queensland; it varies from about 11 to 15 tons, which is doubtless much below what would be expected having regard for the average climatic conditions under which the crop is produced. If the lands could be restored to even a moderate level of fertility, crops substantially in excess of this could reasonably be anticipated; and costs of production could be reduced proportionately. Now it is a happy circumstance that many of the cane farms of the district are appreciably larger than the net harvestable area, and it would be possible for farmers to adopt a system of crop rotation whereby nature's own remedy of long fallowing under grass could be invoked to rejuvenate the worn-out soils, while allowing of intensive cultivation methods on the area cropped annually to cane.

Planning the Rotation.

The main objection to such a policy is that the land thus thrown out of production would still be subject to rates and taxes, whilst yielding no revenue to the farmer; and it was with the object of demonstrating the value of a well-designed rotation system, combined with

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1938.

some revenue-producing accessory crop, that one block of the Mackay Sugar Experiment Station was set aside, when the new Station site was acquired some three years ago. The block selected was actually a low-lying area, much of which is subject to flooding during periods of heavy rainfall, and on which young cane crops were regularly affected by wireworms as a consequence. When it was brought into the experiment, the block carried a rank growth of para grass (*Panicum muticum*), which proved very difficult to destroy by cultivation methods. The field is 16 acres in area, and it was sub-divided into eight plots, each of approximately 2 acres. It was planned to follow an 8-year rotation; each year two plots would produce a plant and first ratoon crop of cane respectively, while the balance of the area would be under pasture. A well-planned system of surface drainage was necessary, first of all, and considerable difficulty was experienced in eliminating the minor topographical irregularities which had been brought about by previous cultivation methods.

Plate 67.
Merino-Corriedale ewes, Mackay Experiment Station.

The first plot was planted to cane in 1936, and a moderate application of mixed fertilizer and sulphate of ammonia was given. In 1937 this plot was harvested and ratooned, while the second plot was planted to cane. During 1938, two plots of cane will be harvested; that carrying the present ratoon crop will later be ploughed out, a green manure crop grown and turned under, and then seeded once more to grasses. Cane will not be planted again on this plot until 1944, following a further green manure crop after the sod has been broken up. The trash from all cane crops will be conserved as a surface mulch and returned to the soil in due course.

Revenue will be derived from the grasslands by the process of stock grazing. This method ensures the best utilization of the grass crop, while the bulk of the plantfood and humus forming materials are voided by the animals, to rot down and enrich the land. During periods of fodder shortage, the use of cane tops or other roughage, supplemented

by a modest molasses ration, will both benefit the animals and add further to the potential humus-building residues and soil plantfood reserves.

Sheep were selected as the most suitable stock for the purpose. It had been demonstrated that they would thrive on the coastal lands, though perhaps not on an area so "wet" as that represented by the experimental block under consideration. Furthermore, in small flocks these animals would impose a minimum demand on the time of the canegrower, and could be expected to return a reasonable income from the sale of their wool, and their progeny. A selection of twenty-five young Merino-Corriedale ewes was obtained, and mated with a Romney Marsh ram for the production of good-type crossbred lambs.

Progress Results.

The results of the experiment to date are highly encouraging. The sheep have survived two wet seasons, with intermittent flooding of the block, without ill-effects, and though they have been inspected at frequent intervals, little evidence has been found of internal parasites; an occasional drench has served to maintain them in a healthy state. No serious foot troubles have been observed, and the animals have retained excellent condition throughout.

The first lambs from the cross made rapid progress from the start. The plan is to retain the crossbred ewes for breeding purposes, while slaughtering the wethers for the local trade. The rapid development shown by the lambs may be gauged from the following table recording ages and weights:—

Lamb No.	Age (7/2/38).	Live Weight. 14/1/38.	Live Weight. 7/2/38.	Gain in Weight. (24-day period).
		Lb.	Lb.	Lb.
61	14 weeks	34	48	14
67	16 weeks	46	58	12
68	16 weeks	47	61	14
69	18 weeks	63	77	14

During this period the ewes and lambs were on natural pasturage only.

Quality of Lambs.

Four wether lambs were slaughtered at ages of 19-20 weeks, and special attention was paid to the quality of the carcases. The live and dressed weights were:—

Live weight.		Dressed weight.
73 lb.	.. ..	40 lb.
69 lb.	.. ..	33 lb.
59 lb.	.. ..	29 lb.
64 lb.	.. ..	32 lb.

The average dressed weight was just over 50 per cent. on the live weight. Three of the carcases were graded as good average quality, while the fourth was classed as good export grade. It is interesting to note that

this was the smallest of the four, and was more strongly of Merino type than the others. The average value of the animals was about 18s. per head.

Comments by consumers on the quality of the cuts were most favourable, and it may be concluded that animals of suitable type can be produced under these conditions. Absence of a regular supply of lambs for the Mackay market makes it difficult to assess probable demands, but doubtless such would follow. At the present time the trade tends to favour an animal dressing to 40 or 45 lb.

Value of Rotation.

It is, of course, too early as yet to draw any conclusions regarding the value of the rotational system on the productivity of the soil. Two of the plots have produced mature crops of cane, while the third is now under young plant cane. Doubtless the plots which are brought under cane in succeeding years will give progressive indications of the benefits to be expected. For the present, one can only say that the experiment shows good prospects of success, and is sufficiently advanced to warrant an expansion of the project by canegrowers of the Mackay district.

THE ADAPTABILITY OF THE MERINO.

Large areas in Western Queensland carry a good covering of high-quality grasses, but are largely devoid of either shrubs or trees. On these exposed plains the breeding of sheep cannot be carried on successfully, but, fortunately, they are within reasonable distance of other areas which, while similar in other respects, are shaded by a variety of shrubs and trees. Many western holdings include both classes of country, and ewes and growing sheep can be held on the shaded area, while wethers for wool production are run on the open plains. On holdings where no shade exists, fully-developed wethers are purchased from properties more favoured for breeding, and are then run for wool production.

In the southern division of the State, the country ranges from the cold granite and traprock country of the Stanthorpe district to the rich plains along the New South Wales border. Intermediate types are the poor ridges interspersed between fertile plains, the vast areas of brigalow and belah which were held in the grip of the prickly-pear until a few years ago, and the excellent mulga country in the St. George-Charleville-Cunnamulla and far western districts.

Although the mulga country has a low carrying capacity, it is, when partly improved, suitable for breeding purposes, and supports some excellent stud flocks.

Brigalow country in its natural state is next to useless for sheep. When improved by ringbarking, it generally develops a rank weed growth. By stocking heavily with cattle, the weeds will be kept in check, and, subsequently, will give way to a good mixture of grasses, suitable for sheep. When cleared of excess timber, breeding can then be carried on successfully. As a general rule, however, the land should be seeded down to Rhodes or other suitable grasses after ringbarking.

Plate 68.
A mob of travelling sheep near Barcaldine Downs, Central Queensland.

The granite and traprock country is most suitable for running wethers for wool production. The extreme conditions under which merino wethers can be used to advantage is illustrated by the fact that wethers selected for wool production on the open plains of the West also do well on the high, cold country of the South-East. The type generally favoured for the western plains is a large-framed, plain-bodied, robust sheep which produces a good length of bold-growing, medium to strong wool. Wethers of this type thrive on treeless plains, with no protection of any kind, and suffer no ill-effects when the shade temperatures are high for days, and sometimes weeks, at a time.

The sheep selected for the granite and traprock belt of the South-East are usually four-tooths of the finer-woolled type, but of similar strain to those selected for the West. Each season, after they have been placed on the granite or traprock country, their wool fines down, probably owing to a combination of climatic influences and the finer nature and less nutritive quality of the grasses. They do not cut as heavy a fleece as western wethers; but, if kept free from parasites, they do well even on the cold bleak heights ranging up to 3,000 feet above sea level. The adaptability of the merino to such extremes of climatic conditions is quite remarkable.

—*Jas. Carew.*

FAT LAMB PRODUCTION.

Gratifying results have followed the scheme initiated by the Minister for Agriculture and Stock with the object of stimulating the production of fat lambs. Rams of British breeds, comprising Border Leicesters, South Downs, Dorset Horns, Shropshires, and Romney Marsh, were purchased in the South and distributed to farmers who had cultivation available, or who were prepared to cultivate. In certain cases in which a farmer owned a stud ram of a particular breed, stud ewes were supplied with the idea of fostering the breeding of pure stock. All sheep supplied to farmers are on loan, and remain the property of the Department. The progeny and wool, however, become the property of the farmers concerned.

The greatest drawback to the production of fat lambs on the Darling Downs in quantity has been, and still is, the difficulty of purchasing good crossbred ewes as the mother flock.

If a start has to be made with merinos the best ewe for fat lamb raising is bred by the introduction of one of the long wools, such as Border Leicester, Lincoln, or Romney Marsh into the strong-woolled, robust type of merino ewe. The ewe lambs of this drop should then be retained as the future dams of the lamb-raising flock.

As to suitable ewes for the fat-lamb industry, it is believed that graziers on the fringe of the Darling Downs or further out would find it profitable to join long-woolled rams of British breed with their cast-for-age ewes with the idea of selling the progeny annually as fat lamb mothers on the Downs. Into the crossbred ewe flock, as described, should be introduced a ram of the Downs type. Opinions necessarily differ in the matter of crosses. The South Down is the fashionable lamb at the

present time, but it should be remembered that this cross must suffer no check from birth to block. The Dorset Horn gives a very nice lamb, early maturing and hardy. The use of the Border Leicester should be encouraged in every way. In addition to producing an early-maturing lamb that fills every want, it must be remembered that the skin value of this lamb is worthy of consideration to a far greater extent than either the Dorset or the South Down.

Pure-bred Corriedale ewes are hard to come by, but should the opportunity occur a farmer would be well advised not to let it slip. Pure Corriedales are hard to beat, good mothers and heavy milkers, besides growing a profitable fleece.

Generally, the wool from a flock retained for fat lamb breeding is a secondary consideration when compared with the production of fat lambs.

—*J. L. Hodge.*

CONCENTRATES AND LICKS FOR DAIRY CATTLE IN WINTER.

Stock licks are necessary in many districts throughout the year. However licks plus dry grazing will not be sufficient to maintain stock in reasonable condition, because the protein present in such a combination is not sufficient.

The provision of a protein concentrate is essential if condition and production are to be maintained. The actual form in which the concentrate is to be fed will be largely a matter of convenience and cost.

Most farmers are acquainted with the commercial protein concentrates, e.g., linseed meal, cotton seed meal, coconut oil cake, blood meal, and the various nut cakes commonly used for drought feeding of sheep. Advice on the use of these can be obtained from the Department of Agriculture and Stock, Brisbane.

Farmers are urged to provide protein in the form of any of the well-known protein-rich foods mentioned, selecting the particular one that best suits their convenience and economic requirements.

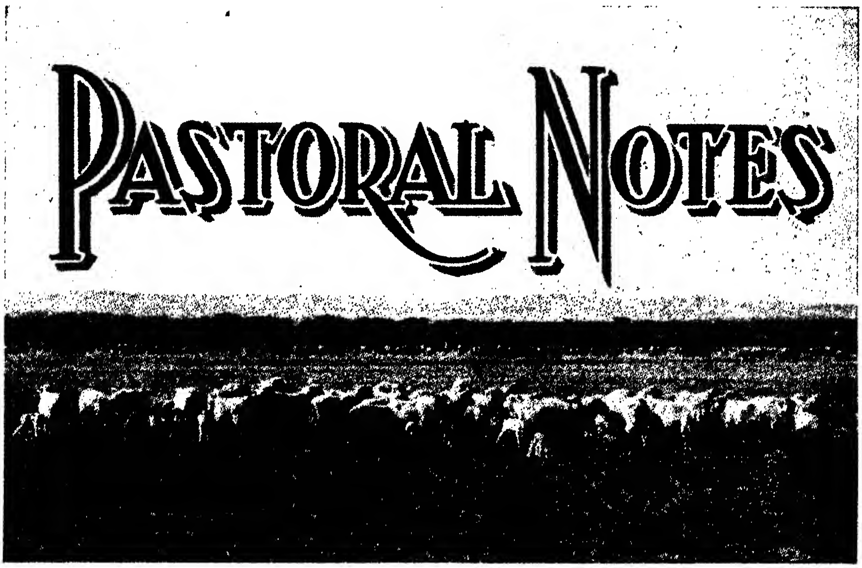
RADIO SERVICE FOR FARMERS.

From National Station 4QG (or 4QR) (Relayed to 4RK Central Regional and 4QN North Regional).

Arrangements have been made with the Australian Broadcasting Commission (Queensland) for the regular delivery, in interesting dialogue form, of talks to farmers by officers of the Department of Agriculture and Stock during the

COUNTRYMAN'S SESSION 4QG (or 4QR) EVERY SUNDAY MORNING,

Beginning at 9.10 a.m.



Difficult Parturition.

W. DIXON, District Inspector of Stock.

CASES of difficult calving are fairly common, and a few hints as to what to do and what not to do may be of value.

When calving becomes imminent, the cow leaves the herd and seeks a quiet spot. There she will become restless—getting up and lying down—and show evident signs of pain.

As labour advances the back is arched, the hindquarters are drooped, and straining becomes violent and continuous. Meanwhile blood may appear on the vulva and tail, and the waterbags protrude between the lips of the vulva. They increase rapidly and the feet of the calf may be seen within them.

The waterbags furnish a soft uniform pressure for the preliminary distention of the womb and passages, and prepare the way for the delivery of the calf. In normal presentations, it is wrong to break these bags prematurely.

When the cow calves standing up, the navel string breaks when the calf falls to the ground; but, when she calves lying down, the string is broken when she rises. A few hours after calving normally, afterpains commence and the placenta or afterbirth is expelled. If this is not expelled within twenty-four hours, it should be removed by careful traction. A good method is to take two sticks about two feet long, between which the end of the afterbirth is grasped, and rotated around them until close to the vulva, when gentle traction is applied, from side to side, and backwards and downwards, care being taken not to break it. A vaginal douche of boiled water at blood heat, to which has been added a mild antiseptic, should be given. A cheap and efficient outfit for this purpose consists of about 4 feet of ½-inch rubber hose and an ordinary funnel. The end of the hose should have its edge pared off with a sharp knife, and, after having been smeared with carbolic

vaseline, it is introduced into the vagina, and gently pressed forward as far as the womb. The funnel is then placed in the other end of the hose and held above the cow's back, the douche being poured into it.

It is well, at all times, to allow nature to do its work without interference; but, when calving is protracted, and progress is not being made, a careful examination is necessary.

The operator should wear a clean sleeveless shirt, and his arm should be smeared with carbolised vaseline or an antiseptic oil. This protects the arm from poisoning and the cow from the introduction of infective material into the passage.

The hand should now be introduced into the vagina and a careful examination made. It may be found that (1) the waterbags have burst, and that neither the feet nor head of the calf are presented, or that there is a presentation of (2) one fore foot and head; (3) both fore feet, and head back; (4) head with both fore feet back; (5) one hind foot without the other; or (6) other abnormal presentation.

Whatever part is presented should first be secured by a rope with running noose, so that it will not be lost during subsequent manipulation, and may be readily brought into position when the missing parts are found. If the cow is standing, her head should be turned downhill so that the fœtus and abdominal organs lie forward to give more room to bring up the missing head or limb. If lying down, she should be turned over on to the side opposite to that on which the limb is missing. When the missing part is located, no attempt should be made to bring it up during a labour pain, but after the pain has ceased an effort should be made to secure it before the next pain comes on.

If the pains are continuous and violent, they may be checked by putting a tight surcingle round the body in front of the udder. If it is found that the passages are dry, pure olive oil may be run into the womb through a rubber tube. If the head is back, the limbs which are presented should be first secured with a rope having a running noose, then the fœtus should be pushed as far back as possible and an attempt made to secure the head with a noose or hook, and to bring it up into the passage. Having brought the limbs and head into a suitable position, traction should now be applied in a downward and backward direction, but only when the cow is straining.

Pulling when the cow is not straining should not be attempted. Patience and care are necessary. The extraordinary practice of attaching a draught horse or motor car to the fœtus and pulling it out by sheer force is not only cruel, but usually results in the death of both the cow and the calf. After a protracted calving the cow will be exhausted, and she should be provided with a warm rug and bed, also a few bottles of warm gruel.

Points to remember are:—

Do not interfere too soon.

When interference is necessary, exercise patience and take time.

Do not use force until the fore feet and head or the hind feet are secured in position.

Remember to pull only when the cow is straining.

ACTINOMYCOSIS OF CATTLE.

Actinomycosis, "lumpy jaw," or "wooden tongue," is a common disease of cattle. There are two forms of the disease, indicated by the foregoing terms, one of which attacks the bones of the jaw and the other the tongue. Strangely enough, each form is caused by a different type of organism.

These organisms are found on the grass, and infection probably takes place through a small injury to the gums. From there they penetrate the tongue or the jawbone, as the case may be.

Advanced cases are easily recognised by the stockowner. In one form, the tongue is increased in size and may be so large as to project out of the mouth. It is very hard to the touch—hence the term wooden. When the jaw is attacked there is often considerable swelling and pus formation. The pus works its way to the exterior, and openings are produced through which the pus flows. Extension of the process leads to the formation of several openings and the jaw may, as a result of the formation of new bone tissue and inflammatory swelling, grow to an enormouse size.

Bad cases, whether of the tongue or jaw form, lead to emaciation of the animal because of the difficulty in taking food. Owners are not advised to attempt treatment of bad cases. It is better to destroy the animals, as they may cause infection of other stock.

In the case of valuable animals, if the disease is not too far advanced, treatment may be possible, and owners are asked accordingly to get in touch with the Animal Health Station, Yeerongpilly.

Dr. John Legg.

A CRUSH FOR CATTLE AND HORSES.

A crush for holding cattle or horses should be built on every farm. It costs little and occupies a small area; yet it saves much time and labour when full-grown stock are to be dehorned, branded, castrated, speyed, drenched, or otherwise treated. For these operations, the animal should be held in a position which allows of no movement.

The ordinary crush can be arranged to accommodate large or small animals. A series of auger holes ($\frac{1}{2}$ in. diameter) are bored about 6 in. apart along two rails of convenient height on each side of the crush. The holes should be deep enough to seat a bolt or iron pin firmly. The bolt or pin should stand 4 to 6 in. above the rail. These pins—one on each side—serve as chocks against which a cross rail may be placed. By working the animal right to the front of the crush, the pins and rails may be arranged to prevent any "backing." In a similar way the width of the crush may be adjusted to prevent lateral movement.

To secure the head of the animal, the "A" shaped bail-type of structure may be made from a double cross rail between which slide vertical poles attached to the base of the crush posts by stout hinges. With such a crush, many farm operations usually requiring four men can be done quickly and efficiently by a man and boy.

POLLED CATTLE AND THE CHILLED BEEF TRADE.

The need for hornless stock in the chilled beef trade has been stressed repeatedly by every section of the beef cattle industry.

In any programme of breeding or of grading up existing herds, the introduction of polled stock must be regarded as a necessity. Shorthorns and Herefords represent the bulk of the beef cattle in Queensland. Increased numbers of polled bulls of both these breeds are being imported. The polled Shorthorns and Herefords are a comparatively recent development, and the percentage of polled stock which will result from crossing with horned breeds is uncertain.

With the so-called "natural polls," the power to transmit this characteristic is marked. It is most noticeable in the Galloway breed, but this type is not well represented in Australia.

Red polled bulls crossed with horned breeds or their crosses may produce a large percentage of hornless stock, but the prepotency of Aberdeen Angus bulls with respect to colour, confirmation and hornlessness is superior. From 80 to 90 per cent. of the calves obtained when Aberdeen Angus bulls are mated with horned stock of mixed breeding are black in colour and most of them are hornless.

RED-WORMS IN HORSES.

Red-worm disease is one of the most important diseases of horses in Queensland. The disease is caused by the presence of large numbers of red-worms, which inhabit the first part of the large bowel. These worms vary in size from about ½ inch to 1½ inches in length and, in a freshly-killed carcase, may be found adhering to the membrane on the inside of the bowel. Their reddish colour is due to the fact that the worms suck blood.

If the worms are numerous, the infested animal does not thrive well, the coat becomes rough, and loss of condition and weakness follow. Diarrhœa is frequently present, and in severe cases the blood becomes thin, the eyes become sunken, the whole appearance of the animal becomes very dejected, and finally death may supervene. The symptoms are gradual in their onset, and the disease may thus be in an advanced stage before it attracts the attention of the owner.

The worms do not multiply within the bowel, and each one of the many thousands that may be present has been picked up as a young worm from the pastures. These young worms in the pastures have arisen from worm eggs which have been passed from the body of the horse in the dung. As these young forms may live among the grass as long as four years, a paddock on which horses are permanently grazed may become heavily infested.

The most efficient drug for the treatment of red-worm disease is oil of chenopodium, which may be most easily administered, after mixing with raw linseed oil, by means of a bottle or a drenching bit. The animal to be treated should be starved for thirty-six hours before, and for four

hours after the administration of the drug. The oil of chenopodium is given at the rate of 1½ drams for every 250 lb. live weight in 1 to 2 pints of raw linseed oil. Oil of chenopodium is a highly poisonous drug, and those wishing to use this treatment are advised to get in touch beforehand with the Animal Health Station, Yeerongpilly. In areas possessing a high rainfall, three or four treatments should be given during the year.

In addition to treatment, an attempt should be made to prevent reinfestation. For this purpose, it would be better not to graze horses continually in a single paddock, particularly if it is swampy. Attention should be given to the regular collection of manure from stables and yards. Heavy stocking is not to be recommended, and young horses (up to three years) should, if possible, be kept away from pastures that have been much grazed by horses.

—*Dr. F. H. S. Roberts.*

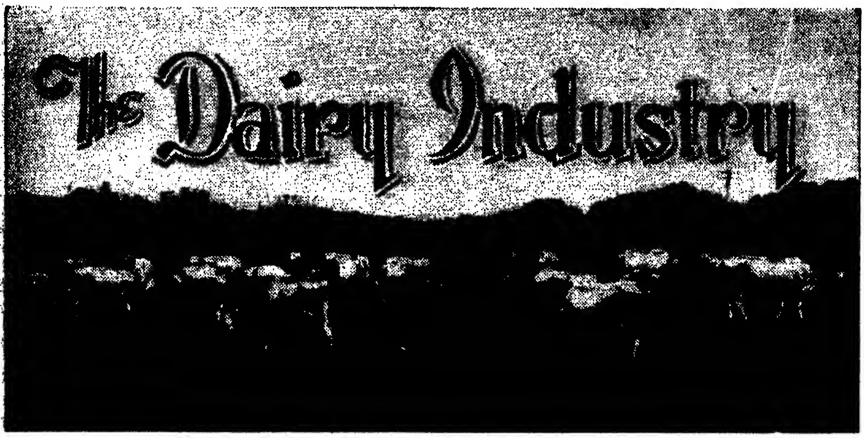
TWO WEEDS POISONOUS TO STOCK.

On the Darling Downs, in the Maranoa district, and in some other parts of Queensland, there is a very common weed sometimes seen in cultivation and along watercourses. It is upright in growth, about 3 feet high, with white flowers followed by a spiny seed pod, splitting at the top into four parts, and containing a large number of blackish seeds. In the districts mentioned it generally goes under the name of castor oil and the question is often asked if it is the true castor oil of commerce.

The fact is that the true castor oil is a different plant. The seed pods are superficially alike, but the plant is very much larger. Instead of being a small weed of cultivation, it is a shrub, or even a small tree, up to 10 feet high. It is very common around vacant allotments in coastal towns, and along creek and river banks in the near coastal districts. The seeds of the true castor oil are also poisonous and have sometimes been eaten in the mistake that they would have the same effect as a dose of castor oil. People who have accidentally or intentionally eaten the seeds have become violently ill, and it is said that in some cases even death has ensued. When the oil is expressed from castor oil seeds the residue contains a poisonous principle, and this precludes the use of castor oil cake as a stock food.

The other plant is strammonium or thorn apple, and all parts of this plant are poisonous. It possesses a nauseating odour and flavour, and, because of this, the standing plant is rarely eaten by stock. On several occasions, however, the seeds and parts of the dried plant have been found as an impurity in chaff, and have caused the deaths of working horses and town cows. The seeds of this plant are the most poisonous part and poultry should not be allowed to run where the plant is growing.

—*C. T. White.*



Tuberculosis in Dairy Cattle and Pigs.*

J. C. J. MAUNDER, B.V.Sc.

THE influence of dairy cattle in the transmission of tuberculosis to pigs, resulting in partial and complete condemnations of carcases, is universally recognised. Much confusion seems to exist, however, concerning the relative importance of the various channels of infection.

The popular belief is undoubtedly that milk from infected cows fed to pigs is the most important source of infection. Actually, in conditions under which pig-raising is carried out in Queensland, milk infection is of minor importance compared to the degree of infection caused by ingestion of materials contaminated by dung of tuberculous cattle.

Consideration of the following facts will explain the relative importance of milk infection and infection from body excretions:—

It is well known that a cow with tuberculous lesions of the udder will excrete the organisms in the milk; in addition any tuberculous animal, though udder is healthy, is likely to intermittently excrete the bacillus in the milk. Personal observations obtained from tuberculin testing and post-mortem examination of reactors has revealed the fact that the percentage of udder lesions is small, not exceeding 2 per cent. of tuberculous animals. Therefore, approximately 98 per cent. tuberculous animals merely excrete the organism in milk at irregular intervals, some infected animals never excreting the organism in the milk.

Before tuberculous infection becomes established in a pig repeated ingestion of infective material is necessary. Intermittent ingestion of organisms can usually be countered by the natural body defences, and possibly increases the resistance of the animal to the disease.

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* Reprinted, in a revised form, from the *Queensland Agricultural Journal* for November, 1934, in which this article was first published.

In considering the importance of excretion of the bacillus in the dung of tuberculous cattle, the following facts should be studied:—

(1) Infective sputum in cases of pulmonary tuberculosis is coughed up and swallowed by the beast, reaching the intestinal tract and being excreted in the dung, the organisms retaining their virulence.

(2) Bile of infected animals is often found to contain the bacillus, the source either being lesions of the liver or organisms in the blood stream eliminated through the liver and evacuated with the bile through the intestine.

(3) Intestinal and peritoneal lesions are responsible for the evacuation of bacilli in the dung.

When it is considered that the vast majority of cattle affected with tuberculosis have lesions in either lungs, lympathic glands, pleura, peritoneum, or liver, it will be realised that this group evacuating the bacillus in the dung must constitute a greater menace than the 2 per cent. of udder infections excreting the organisms in the milk. In addition to the presence of the tubercle bacillus in dung of affected animals the organism may be evacuated with the urine when lesions are present in kidney, pelvic lympathic glands or genital organs.

Assuming then that dung of infected animals, or material contaminated with dung, and, to a lesser extent urine, constitutes a greater menace of tuberculous infection of pigs than the ingestion of milk from tuberculous animals, evidence is produced in support of the belief.

Investigation of properties from which pig condemnations have been heavy always reveals the fact that young pigs are allowed free access to areas soiled by droppings of dairy cattle.

One interesting case is quoted. A dairy farmer had for some years suffered heavy losses from pig condemnations. Assuming the source of infection was milk from tuberculous cows he decided to feed only thoroughly-boiled milk to his pigs. In the batches of pigs that had been fed only on boiled milk condemnations showed not the slightest diminution. Therefore, a definite source of infection existed apart from the milk supply. A survey of the herd was made, suspicious cattle destroyed, and methods adopted to ensure that young pigs were not allowed access to areas soiled by droppings from the dairy cattle. Milk was fed without boiling and the condemnations of these pigs were nil. This particular farmer has since adhered to the practice of enclosing of pigs with excellent results.

Another case is worthy of recording.

An owner conducted four farms, the cattle for the four farms being drawn from a common source. Careful periodical inspection and culling revealed that each herd contained from time to time tuberculous beasts. Hence, on each farm, there existed the danger that pigs would contract the infection. Actually, over a period of years, condemnations were always confined to one farm only, and investigation showed that this was the only farm on which pigs were allowed access to areas contaminated by droppings of dairy cattle. Examination of the cattle showed that the health of the cattle in the four herds was of an even standard.

It would appear, after consideration of the incidence of tuberculous lesions in various organs of dairy cattle and the means of excretion of the organisms, and field observations, that material contaminated by

dung from tuberculous animals constitutes a greater menace to the health of pigs than does milk from infected cows.

In further consideration of the problem, the feeding habits of young pigs should be observed. Notice how the pigs roam around nosing under dried clumps of manure, seeking the small green shoots of grass and herbage. The tubercle bacillus present in the dung from affected cows has been existing under conditions ideal for the maintenance of its virulence, that is moisture and protection from light. There is, therefore, great danger of infection of scavenging pigs with virulent organisms.

When cattle have been fed on whole corn a proportion of the corn is passed out unchanged and forms a great attraction for the pigs. In picking out the grain from the manure there is great danger of infection with organisms excreted from a tuberculous beast. Young pigs having access to offal of animals slaughtered is also most undesirable, while the practice of slaughtering diseased cattle and feeding to the pigs is disastrous.

Methods of Dealing with the Problem of Condemnations in Pigs.

1. Where condemnations have been heavy over a long period, it is desirable to make a survey of the entire herd, selecting any suspicious beasts for the application of the tuberculin test. Selection of such beasts should be guided by the following clinical symptoms:—

(*a*) Deep distressing cough, sides heaving, tongue protruded.
(*b*) Difficult snoring respiration.
(*c*) General debility, staring coat, dull, sunken eye, the whole giving an impression of a sick animal, reluctant to move about.
(*d*) Enlarged lymphatic glands of head and neck, pre-scapular, pre-crural and mammary regions.
(*e*) Falling away in condition following calving.
(*f*) Large swellings in the udder, usually high up at the back.
(*g*) One or more quarters not functioning.
(*h*) Muco-purulent nasal discharge periodically expelled by violent snorting.

In addition to the above select the offspring of an animal known to have been tuberculous.

By the selection of cattle as outlined, submission to the tuberculin test, slaughter and burning of reactors the herd can be cleaned of animals most likely to have been the source of the trouble.

It is well known that cattle may be tuberculous to a considerable extent and exhibit no symptoms, and it is likely that such cattle would still remain in the herd after selection.

Infection from such cattle is effectively prevented by strict enclosure of young pigs from time of birth until marketed, thus preventing access to infective droppings and material contaminated by same.

2. Where it is not possible to have the tuberculin test applied, culling of animals exhibiting the symptoms outlined, and enclosure of pigs will yield good results. However, this method, i.e., culling without the aid of the tuberculin test, is likely to result in culling of non-tuberculous animals.

3. Where condemnations are light, consisting chiefly of heads with only an occasional carcase, it will often be impossible to select any really suspicious beast that may be responsible. In such cases, excellent results are obtained by simply paying attention to the complete enclosure of the pigs.

4. Application of the tuberculin test to the entire dairy herd with slaughter of reactors is the surest method of eliminating tuberculosis in the pigs. If the per cent. infection is high, the herd should be tested again within six months and a third time within twelve months.

Testing of suspicious animals only will result in temporary relief from condemnations, but testing the whole herd is the only way to permanently eradicate the disease.

Occasionally the condemnation of carcases cannot be traced to the dairy cattle as the source of the tubercular infection. Under such circumstances the brood sows may be responsible, though actually such is rarely the case. When brood sows are solely responsible for condemnations, it is not difficult to diagnose due to the fact that the sow will exhibit rather marked symptoms. Chief of these are swellings in the head and neck region, sometimes discharging; marked digestive disturbances leading to emaciation; short dry cough later becoming distressed with difficult breathing; swollen joints which may discharge cheesy purulent masses.

The mere fact that although sows are often suspected and slaughtered they are usually found to be healthy, rather supports the belief that the milk from the dairy herd is not responsible for tuberculosis of the young pigs. Should the milk be solely responsible for all the condemnations of pigs for tuberculosis, surely it is obvious that breed sows in piggeries suffering condemnations would, despite greater resistance due to age and repeated light infections that had been overcome, also contract the infection, and within a year or two the majority of brood sows would be suffering from advanced tuberculosis leading to occasional deaths.

One additional source of infection worthy of mention is the poultry.

Pigs are susceptible to the strain of the tubercle bacillus causing the disease in poultry, and it should be remembered that tuberculous poultry excreting in pig pens are capable of transmitting the infection to pigs.

Fortunately avian tuberculosis, as far as can be determined, is of rare occurrence in Queensland. Hence, this source of infection is not so important as in other countries.

Summary.

1. The source of practically all tuberculosis in pigs in Queensland is the dairy cow.

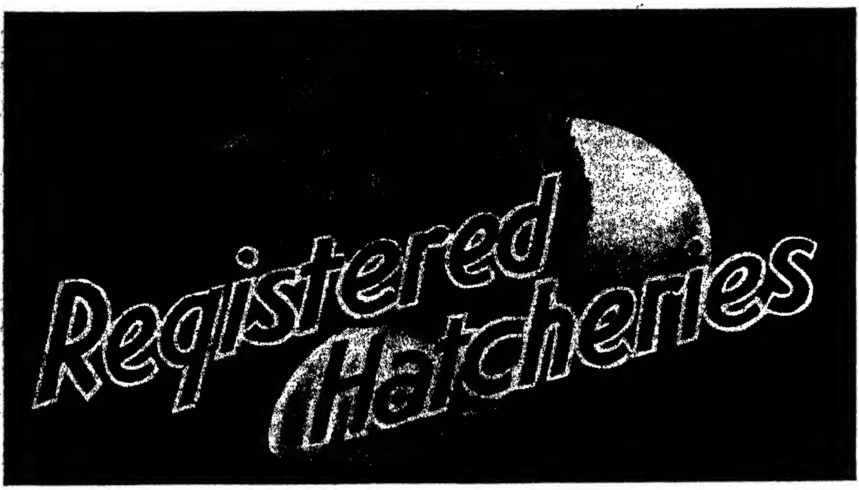
2. Infection of pigs takes place chiefly—

(*a*) By ingestion of infective milk;

(*b*) By ingestion of material contaminated by infective droppings.

3. Infection by ingestion of material contaminated by infective dung is of greatest importance under conditions of pig-raising usually practised in this State.

4. Attention to health of the cattle, and complete enclosure of pigs preventing danger of ingestion of contaminated material will result in the elimination of persistent condemnation of tuberculous carcases.



Registered Hatcheries.

OBJECT OF REGISTRATION.

THE registration of hatcheries has for an object the distribution of healthy chickens, the progeny of parent stock of good type and production ability.

The following clauses of Regulation 29 of "*The Diseases in Poultry Acts,* 1923 *to* 1937," will indicate the obligations of owners of Registered Hatcheries:—

(iv.) He shall have all poultry at or upon or kept at or upon such hatchery tested for pullorum disease at the times and in the manner from time to time required by the Chief Poultry Expert. He shall pay to the Minister the cost of every such test.

(v.) He shall not place, permit, suffer, or allow to be placed in an incubator at such hatchery for the purpose of incubation, any egg which shall be less than 2 oz. in weight.

(vi.) He shall not sell or offer for sale any chickens other than chickens which are healthy and normal and shall not sell or offer for sale any chickens which are deformed or injured in any way, or which have weak navels.

(vii.) He shall at all reasonable times permit the Chief Poultry Expert, any Inspector, or any officer to enter into or upon such hatchery and inspect the same.

Following is a list, giving the name of the owner of the hatcheries, registered up to and including 30th June, 1938:—

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire ..	White Leghorns, Australorps, Rhode Island Reds, and White Wyandottes
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	White Leghorns and Australorps
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard ..	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
T. G. Crawford, Stratford ..	Rho-Isled ..	Rhode Island Reds
Rev. E. Eckert, Head street, Laidley	Laidley ..	Australorps, White Leghorns and Langshans
Elks & Sudlow, Beerwah ..	Woodlands ..	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
J. W. Grice, Loch Lomond ..	Quarrington ..	White Leghorns
C. & C. E. Gustafson, Tannymorel	Bellevue ..	Australorps and White Leghorns
F. J. Lambert, Acacia Vale, Townsville	Lamberts ..	Australorps and White Leghorns
J. McCulloch, Whites road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns
A. Malvine, junr., The Gap, Ashgrove	Alva	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullen Vale ..	Pennington ..	Australorps, White Leghorns, and Black Leghorns
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
F. J. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen ..	Kureen ..	White Leghorns and Australorps
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, White Wyandottes, Sussex, Rhode Island Reds, and Brown Leghorns
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
E. E. Smith, Beerwah	Endcliffe ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
P. A. Wright, Laidley	Chillowdeane ..	Brown Leghorns, White Leghorns, and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg Young's ..	White Leghorns, Brown Leghorns and Australorps

AUSTRALIAN PRODUCE AT MANCHESTER.

Australia had a lavish show of produce at the Manchester Grocers' Exhibition. Pride of place was given "to the excellent Australian butter and the well-known dried fruits which have won a richly deserved place in the trade by their high standard of quality."

Marketing Eggs and Poultry.

P. RUMBALL, Poultry Expert.

EFFICIENCY in egg and poultry producton is of little use, unless the same degree of effectiveness is extended to marketing. The quantity of eggs marketed at less than top values, because of lack of quality, definitely indicates that all the care that is necessary has not been extended to the marketing of the commodity. The loss sustained by the individual in the marketing of second-quality eggs is from 12 to 15 per cent. The loss incurred on poultry is more difficult to ascertain, but producers should realise, however, that the better the appearance of the birds, the better the demand, and the better the value.

On a commercial farm of approximately 1,000 birds there would be a little more than £600 worth of eggs sold per annum, and about £125 worth of live birds. These figures indicate that any reduction in receipts due to depreciation of egg quality and birds marketed could have a very serious effect upon the soundness of a poultry raising undertaking. The inferior quality of egg, as well as being unprofitable to those engaged in the business, has a depressing effect on local values, and has a tendency to reduce local consumption, consequently every effort should be directed to the maintenance of high-quality production.

Protecting Egg Quality.

As the loss due to deterioration in quality can be so great, it will readily be understood that every step should be taken to prevent this deterioration. To too many farmers, the egg is just an egg, and little thought is given to its quality. The producer should not lose sight of the fact that the hen provides a highly nutritious food in a convenient form, specially wrapped and sealed within a shell, although of a highly perishable nature.

A brief outline of the structure of the egg and the various causes of depreciation in quality it is hoped, will make for better care in handling and for the acceptance of recommendations made with the object of maintaining quality.

The yolk is the first part of the egg to develop. This takes place in the ovary where many hundreds of yolks are situated in various stages of development. Each yolk is enclosed in a sac, which, when the yolk is mature, ruptures along the non-vascular area, releasing the yolk into the oviduct. Occasionally this rupture extends beyond the non-vascular area, causing bleeding from one of the small blood vessels of the yolk sac, with the result that the yolk is released with a clot of blood. The presence of blood with the yolk renders the egg unmarketable on account of its appearance. When a producer is faced with a high percentage of such eggs, he should examine the system of feeding. Over stimulating foods are suggested as the probable cause, and if an examination of the total ration supplied indicates that the protein content is in excess of 15 per cent. the ration should be altered to reduce the crude protein content to that level; such alteration having as is object the reduction of the incidence of eggs with blood spots.

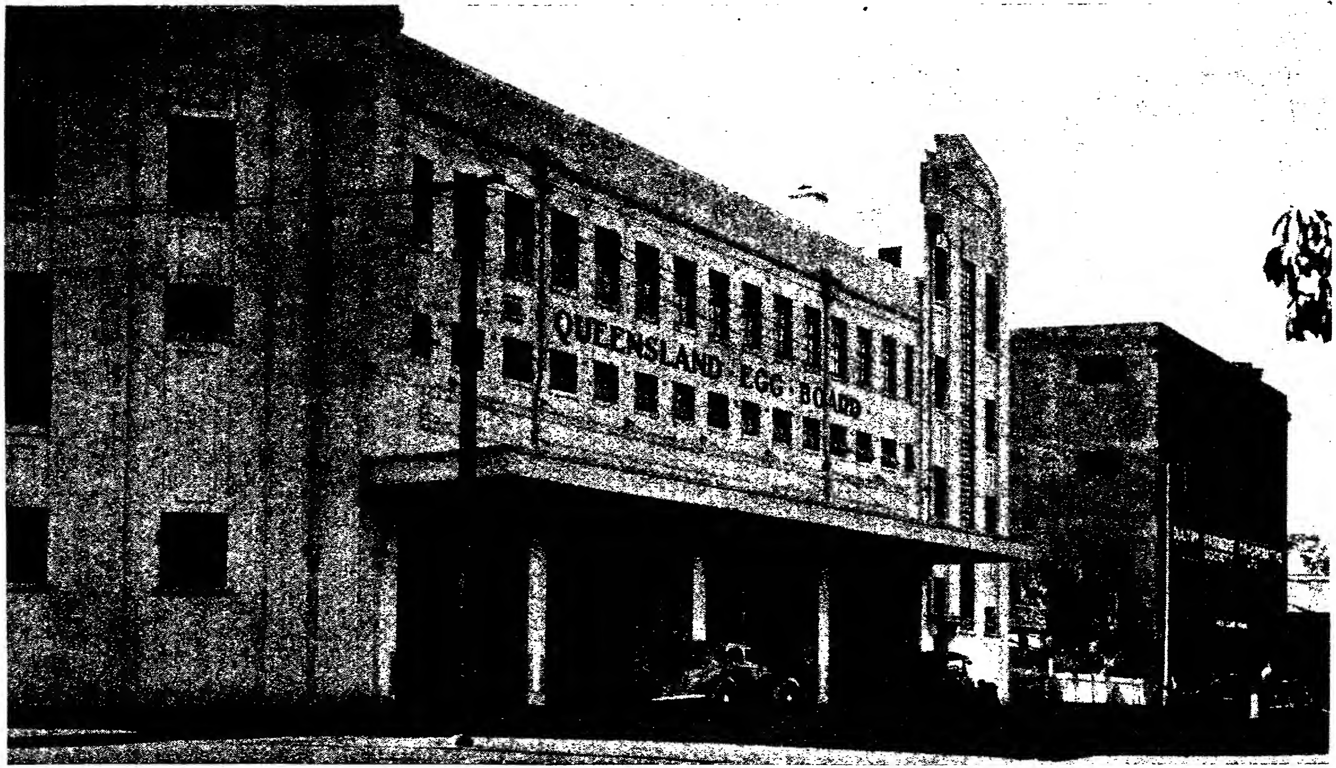


Plate 69.

The Modern Premises of the Queensland Egg Board, Showing also Premises of the Poultry Farmers' Co-operative Society.—For the year ending June, 1938, the average price paid to suppliers by the Board was 1s. 1.16d. per dozen, and a total to the industry of approximately a-quarter of a million pounds. The Board has distributed to producers £43,000 as profits on export since 1934, and it is anticipated that for this year approximately £8,000 will be

The colour of the yolk is influenced by feeding, and may vary from that of a pale straw colour to a deep orange red. The colour most sought after is that of a good golden yellow, and breeders who are producing pale yolks may improve colour by feeding yellow maize and green feed.

As the yolk passes down the oviduct it gathers several layers of albumen. The first is a layer of dense albumen and the formation of what is termed the chalaza. The chalaza is that thickened, twisted mass of albumen that may be noticed when an egg is broken into a dish, extending from the yolk on opposite sides. The chalaza is intended to keep the yolk more or less centred in the egg. Passing further down the oviduct, the second layer of albumen is laid on; this is not so dense as the first. Then another layer of thinner albumen, followed by the two membranes, and then lastly the shell is added. The shell is not laid on in its solid form as seen, but by the accumulation of lime salts in more or less a semi-liquid form which becomes hardened before the egg is laid. Naturally there are minute pores between the particles in the shell-forming material. Nature, as a further protection, coats the egg with a gelatinous material before it is laid.

This coating is frequently referred to as the "bloom" of the egg, and if the egg could be carefully collected from the hen when laid, and allowed to dry, one would have then the best possible product to handle, and if given the correct subsequent treatment, there would be little cause for complaint as to quality. This, however, is not possible under commercial conditions, but it would be as well at the outset to realise that the less removal of the protective coating the better is the keeping quality of the egg, and therefore the producer should do all in his power to maintain the egg in its nearest approach to that as laid and realise that until some protective medium is found, which may be added to any fluid used for washing eggs, without detriment to the egg, that such washing renders the egg more susceptible to deterioration.

The poultry raiser has three principal factors to give consideration to in the protection of the egg quality—

(1) Fertile eggs;

(2) Soiled eggs;

(3) The effect upon the egg of heat.

There are other influences to which eggs may be exposed which affect quality, namely, the attack of moulds and bacteria. These influences, however, are not common where the best possible conditions for production have been followed.

The production of fertile eggs should be avoided as far as possible. Although incubators are operated at a temperature of 100 deg. Fahr., it does not need a similar temperature to commence the development of the germ, and in the height of summer it is almost impossible on many of our farms to keep eggs at a sufficiently low temperature to prevent some form of cell division taking place with fertile eggs, and once embryonic development has advanced to any degree and stops, decomposition soon follows.

Under these circumstances, males should not be allowed to run with the flock, excepting during the period when breeding practices are in operation.

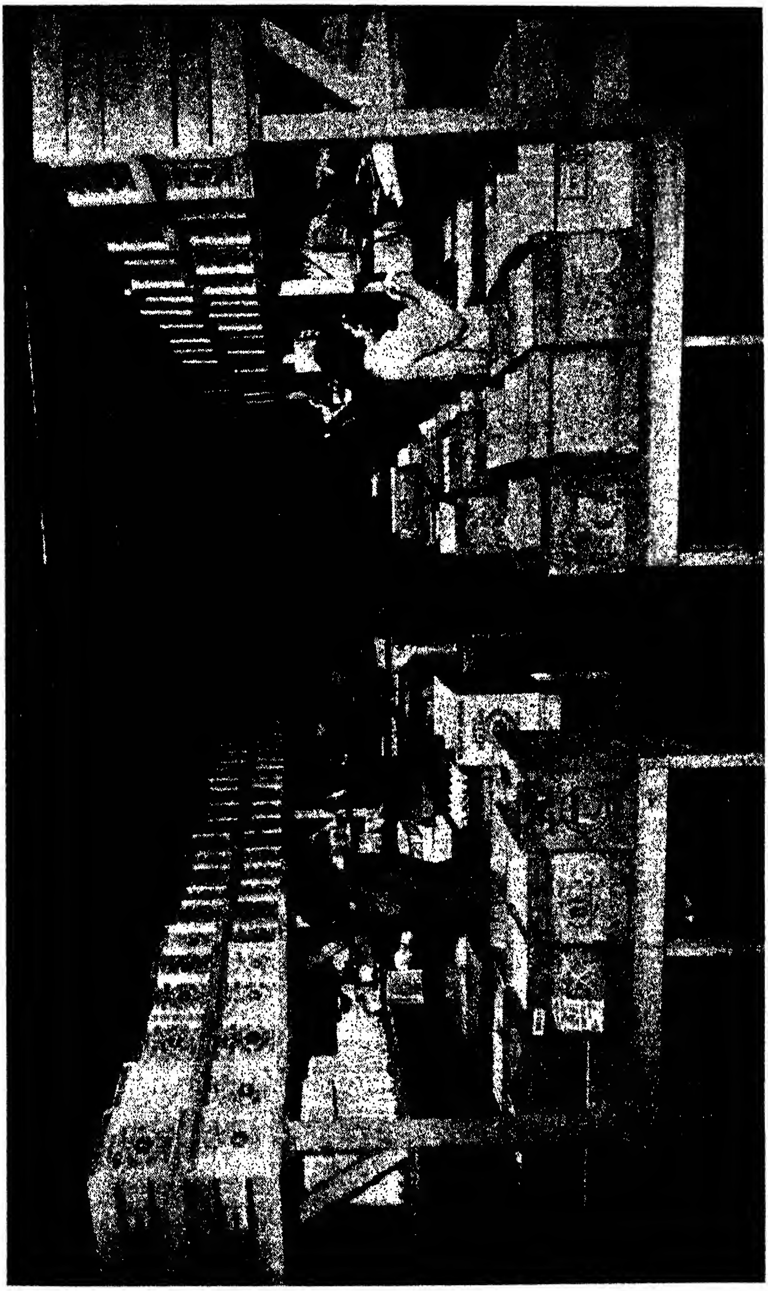


Plate 70.

View of Section of the Floor on which Eggs are Candled.—Every egg received by the Board is submitted to this process. In this way, eggs are correctly graded for sale to retailers. During the peak period of 1937, no fewer than 73 girls were employed in the grading and packing of eggs.

The next condition to guard against is the soiling of eggs within the nests. Naturally, an ample supply of clean nests, sufficiently roomy for the bird should be provided. In these nests it is essential to have some form of material to make the nest comfortable and attractive to the bird, to protect the egg from being broken, and to protect the egg, as far as possible, from becoming soiled. Many egg producers use old butter boxes for nests. These, in size, are very suitable, and in planning any form of nests, the butter box could be used as a guide for size. The big factor is to construct nests so that they are readily cleaned, and of material that is free from odours as eggs, like milk, readily absorb taints.

Various forms of nesting materials are used, such as straw, shavings, sawdust, sand and shell grit. Shavings and sawdust are very absorbent, and not scratched out of the nest to the same extent as straw, and by reason of their fineness, are more absorbent, and have a greater cleansing effect upon the feet of the birds, thereby preventing, to some extent, the soiling of eggs. If sawdust or shavings are used, pine-wood residues should be chosen, as many of our hardwood sawdusts have a staining effect upon the shell of the egg. Shell grit is a reasonably good nesting material, naturally not so absorbent as sawdust, and too expensive in many districts for extensive use. Sand closely resembles shell grit, but many particles become attached to the moist gelatinous coating of the egg when it is laid, and they are most difficult to remove without washing.

It is not sufficient to provide suitable nests and nesting material. The frequency with which eggs are gathered has a very marked effect upon their cleanliness, and more than that, upon the labour entailed in preparing the eggs for market. Three gatherings per day is a practice that should be followed upon most farms, particularly during that period of the year when production is at its height, and several birds are visiting each nest daily. When production is slack, the gathering of eggs can be reduced to twice daily. Not only does the frequency with which eggs are gathered assist in keeping the eggs clean, it protects also against breakages, and the possible vice of egg-eating being developed.

The Effect of Heat.

The egg, when manufactured, is full. Upon cooling, there is a separation between the two membranes within the shell of the egg, which creates a small air cell. Heat hastens the evaporation of the moisture contained in the egg, enlarging that air cell. The albumen also becomes thinner, and the yolk more visible upon candling, and instead of being retained in a more or less central position of the egg becomes "sided," and at times attached to the shell. When this type of egg is broken for poaching or frying purposes the yolk is flatter, not standing up like a new laid egg, or an egg which has not been subjected to heat, and the albumen by being thin spreads—both conditions which the consumer does not appreciate.

It does not require a very high temperature to cause this breaking down, and it has been found that a temperature over 60 deg. Fahr. is conducive to rapid deterioration of quality. In fact, temperatures of 68 deg. Fahr. have been known to stimulate embryonic development; therefore the coolest position upon the farm should be sought for the storage of eggs pending shipment to markets. Further protection of the egg against excessive heat is given by frequent gatherings, as it prevents their being reheated by the visits of several other birds to the nests.

Eggs should be gathered in 2-gallon buckets with rigid sides. A bucket of this capacity will hold from 100 to 120 eggs, the bulk of which is conducive to the rapid loss of animal heat when placed in cool quarters. The nests should be erected in positions that are not exposed to the sun. For this reason nests extending in front of the poultry sheds are not recommended as most suitable for the preservation of quality. During transit to market cases of eggs should also receive some protection.

The storage of eggs on the farm pending shipment to market is most important. They should be held in a room which is as uniform in temperature as possible. One between 40 deg. and 60 deg. Fahr. would be ideal. It should be free from odours, and have good ventilation. If the air is too dry the humidity may be increased by setting pans of water about the room or sprinkling the floor. Excessive moisture, however, should be guarded against. This is indicated by condensation.

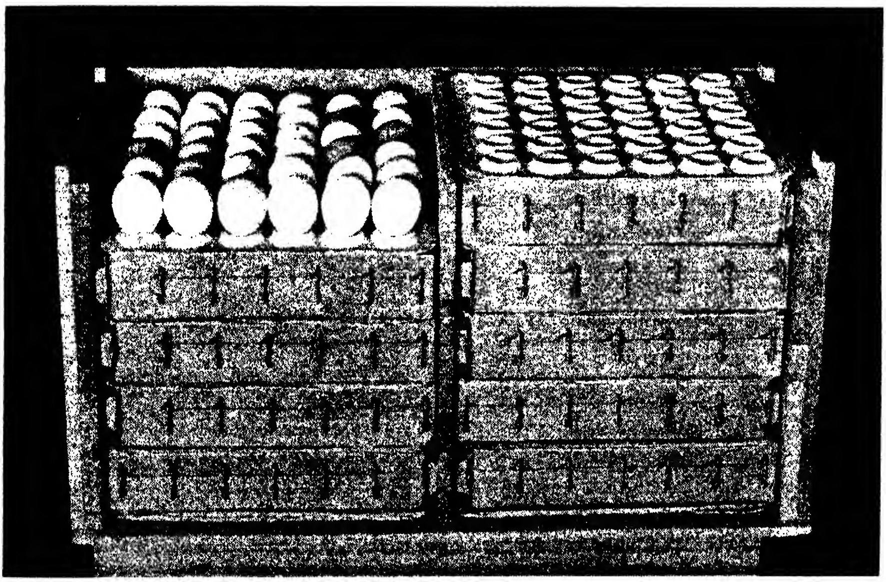


Plate 71.

STANDARD EGG CASE USED BY SUPPLIERS TO THE QUEENSLAND EGG BOARD.—Note one filler removed and the eggs standing up in the flats. It will be seen that a leaking egg is not liable to cause the soiling of others. Observe also that there is no need for any further packing besides that supplied.

Moulds and Bacterial Infection.

Mould invasion of eggs is not uncommon in Queensland, particularly during the humid conditions that prevail in the early part of the year. Mould growths in several instances have been traced to the ordinary brown strawboard fillers frequently used, and on other occasions to nests in which mouldy grass or straw has been used for litter.

Humid conditions are conducive to the development of moulds, which enter the eggs through the pores of the shells, causing them rapidly to develop into what is known as black rots. Protection is afforded by the utilisation in the nests of only sweet and dry nesting

material, by keeping the cases and fillers used for packing as dry as possible, and by never packing eggs that have moisture adhering to the shell.

Bacterial invasion of the egg is not uncommon, and in every instance that has been investigated the infection has extended only to those eggs that have been submitted to a cleansing process by washing. As previously mentioned, washing removes that protective coating placed on by nature, and as it is the frequent practice to totally immerse soiled eggs in water which has been polluted by hundreds of others, it will readily be understood how easy it is to convey harmful bacteria from one egg to another.

As a protection against bacterial invasion of the egg as much of the dirt and filth adhering should be scraped off with a knife while the egg is dry, the water used for washing purposes replenished at frequent intervals, and any cloths used in cleaning kept clean by frequent rinsings, and if the cloth is to be used from time to time, sterilized by boiling. In any cleansing process it may be necessary to remove stains with an abrasive. When such is necessary, select some odourless material which is not of too coarse a nature.

Recently an experiment was conducted by the Missouri Experiment Station in the washing of eggs by adding to the washing water 1 per cent. of lye water as a protective against bacterial invasion. This experiment indicates that the problem of egg quality due to bacterial invasion is not only common to Queensland. The Missouri experiment appeared highly satisfactory, but in view of the caustic nature of the solution used it does not appear to be a practice that could be generally adopted, and it is only referred to to indicate the need for the exercise of the greatest care in production and the desirability of reducing the need for washing until some suitable protective agent is found.

Packing.

The practice of using chaff, &c., for packing material, fortunately, has largely disappeared, and the standard case and fillers adopted. Many producers, however, with the object of effecting greater protection to the egg, use chaff and material of a like nature in the bottom, and frequently the top of the cases. This is not recommended. As well as causing the eggs to become dusty in appearance the practice exposes the egg to infection by moulds. If it is at all necessary to use anything to take up the slack in the case crumpled paper is preferable.

The standard 30-dozen case, as now used by the Queensland Egg Board, is one that obviates the necessity for any further protection, and is definitely recommended to all producers as the best means of packing.

Adherence to the following rules will largely govern the production of quality eggs:—

(1) Breed only from birds that produce eggs of satisfactory size and shape and good-quality shell.

(2) Provide only wholesome food, including shell grit, and fresh water. Remember that yolk colour is improved by the feeding of green feed and yellow maize.

(3) Produce infertile eggs for market, thereby preventing them from decay due to partial embryonic development.

(4) Provide at least one nest and clean nesting material for each five layers. Keep the nests dry and protected from the sun.

(5) Do not allow broody hens to occupy nests. They heat up the eggs.

(6) Gather eggs thrice daily in summer and twice in winter, in a clean bucket, and stand in a cool place until animal heat is lost before packing.

(7) Do not wash eggs unless absolutely necessary to make them thoroughly clean. Aim at keeping them clean by good management.

(8) Keep eggs until marketed in a cool, clean room free from odours.

(9) Market eggs at least twice weekly, protecting them from the sun during transit.

(10) Use only standard cases and fillers for packing.

MARKETING TABLE POULTRY.

The basis of the poultry industry in Queensland is egg production, for which breeds such as leghorns and australorps are bred, the former predominating. Under these conditions the class of bird which forms the bulk of poultry sold for table purposes are young cockerels of both light and heavy breeds and hens culled on account of their age or for other reasons which have rendered them unprofitable as egg producers.

Present System of Sale.

The birds are received by the selling agents by rail or direct from the producer in crates of all types, shapes, and sizes. They are then dumped on the saleroom floor, little effort being made by either the producer or agent in the direction of classification, and sold to the highest bidder.

Undoubtedly, at times, even under these conditions, the birds tendered for sale realise payable prices, but, again, at other periods they are sold considerably under their value. The low values are, no doubt, influenced by the supply and demand, but at the same time, if the birds were classified and displayed to advantage, values would be materially increased.

Classification of Poultry.

A *prime roaster* is a cockerel that has made the maximum development without reaching full maturity. This is indicated by his plumage being just short of adult, his comb not fully developed, and there is no evidence of spur development. Again, he has shown little evidence of sexual activity. If a bird is retained beyond this stage he is referred to as a stag. Most of our dual-purpose birds are best as prime roasters.

Small Roaster.—This term is used for a bird of about three and one-half to four months of age. Many of our early-maturing breeds, notably Leghorns and some strains of Australorps, are very plump at this age, and show the maximum development for the quantity of food consumed. It frequently happens that birds kept over this age develop considerable frame for a time, and appear poorly fleshed.

Grillers.—Young chickens 1½ to 2½ lb. in weight. They must be grown quickly to be plump and marketable, and it is only during the early portion of the season that reasonable values are obtainable.

Culled Hens.—Old hens that have finished their lay or hens culled as being poor producers. Old hens that are to be disposed of on account of age should not be retained until the moult is well advanced. It is frequently more remunerative to sacrifice the few eggs they will produce than to retain them until they are a mass of pin feathers. The following of this practice would make a greater spread of the supplies and be more in keeping with the demand.

A *stag* may be any old cock bird or a cockerel with adult plumage showing evidence of spur development. The flesh upon such birds is tough, and in cooking the same treatment is necessary as in the preparation of an old hen.

The following table indicates the approximate weights which can be expected at different ages of leghorn and australorp cockerels, and also the feed consumed:—

Age.	Leghorns. Feed Consumed.	Leghorns. Weight of Birds.	Australorps. Feed Consumed.	Australorps. Weight of Birds.
	Lb.	Lb.	Lb.	Lb.
10 weeks	5¼	1¾	6⅛	2⅛
12 weeks	7¼	2⅛	9	3
16 weeks	11¼	3	14	4¾
18 weeks	13½	3¼	17½	5¼
20 weeks	..	..	21	5¾

At the age of sixteen weeks leghorns commence to show great sexual activity, and their rate of development slows up. It is questionable if it is economically sound to retain them for a longer period. The same conditions do not apply to australorps until they are eighteen weeks old. Many other dual-purpose breeds are slower in sex maturity, and can be retained longer without loss of flesh quality.

Transport of Poultry.

The conditions under which table poultry are sold undoubtedly leave room for improvement, both from a humane and a commercial point of view. From the humane point of view, the crates used for forwarding birds to market should have sufficient head room and floor space for the number and variety consigned. They should be well ventilated and provided with water receptacles, the latter being firmly attached to each corner of the crate. The crates for fowls and ducks should be at least 18 inches high, and those for turkeys and geese 30 inches. This permits of the birds crated being able to stand erect without injury. The actual dimensions or area required for an individual bird naturally varies according to the numbers and variety to be marketed at one time. Crates 4 feet long by 2 feet 6 inches wide, with a partition in the middle, will comfortably hold sixteen to twenty birds, according to their size and to the prevailing climatic conditions. The object of the partition is to prevent crowding to one end and consequent

losses in the event of the crate becoming tilted in transit. A little thought on the part of the producers for the birds' comfort in transit would prevent overcrowding of crates. If the crates are well made they will last for some time, as well as ensure the comfort of the birds both in transit and while awaiting sale. Good crates are worth being returned from markets, which obviates the necessity of constantly constructing makeshift crates.

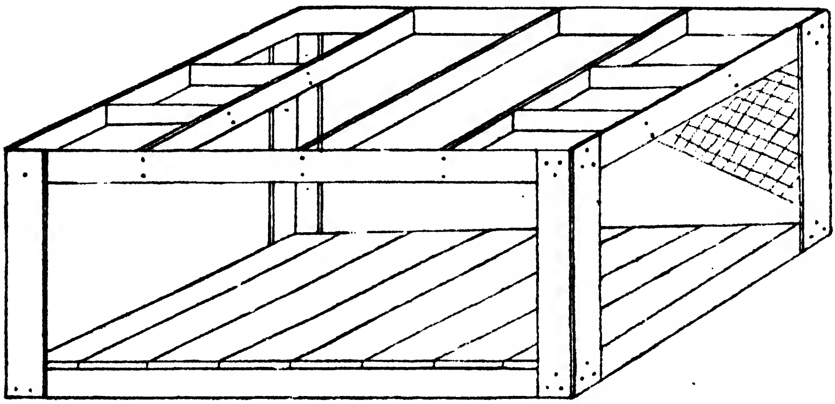


Plate 72.

A Consignment Crate for Poultry.—The sketch illustrates a crate of simple design, the measurements being 4 feet long, 2 feet 6 inches wide, and 18 inches high. It is made entirely of pine, the frame being 3 inches by ¾ inch, and the bottom 6 inches by ⅝ inch. Doors are provided in the top, and the whole structure covered with 1¼-inch mesh netting. If larger netting is used, it is desirable to place a piece of timber around the frame at least 2 inches higher than the floor to prevent the birds' legs protruding and becoming injured.

There is a right time for marketing stock, whether they are young or old. Every day they are kept on the farm after reaching sale condition adds to farm costs. The crates can, with a little care, be so constructed as to permit of the birds being seen to advantage by the buyers. Under the present conditions of selling it is a few minutes' work for the assistant to burst open a crate and pass a bird or two round for inspection. Doors placed on the top of the crate would facilitate this work, allowing buyers greater time for examination.

The individual producer has to consider such questions as the time of marketing, condition of stock, grading, and crating.

Cockerels constitute, possibly, most of the birds that a producer has yearly for sale, and present greater difficulties by reason of the fact that they have to be disposed of during a relatively short period. They may be sold at various ages, each age having its special advantage. Although most buyers prefer young stock for table purposes, they will not pay high prices for small, half-grown birds when larger hens are available, which would proportionately be much cheaper. Having this in view, it is not a desirable practice for the producer to send half-grown cockerels to the market and expect to receive good prices for them during the time when the great majority of our old hens are being disposed of on account of age. This period varies, but usually extends from some time in January until April. Young, half-grown birds will find a ready sale from August until the Christmas season.

After that period young stock should be well grown to command good prices, but not kept until they become staggy, which is indicated by spur growth.

Although cockerels with slight spur development may at times bring remunerative values, it will be noticed that such values are only obtainable at that period of the year when there is a shortage of supplies, and that during the period when prime cockerels are available those carrying spur development are not sought by buyers.

It is necessary to give some attention to the general condition of the birds to be marketed. No good is done by sending stock low in condition to the selling floor. It is not suggested that any attempt be made to fatten this class of bird, as they generally are constitutionally unfit, and the producer's ends would be better served if they were destroyed, for it may happen that these particular birds will be the first to be examined by prospective buyers. Cockerels, however, should receive some consideration, and not be treated—as they too frequently are—as an encumbrance and not worth feeding. If they are to be kept for any time at all they should be well treated and receive the same attention as the pullets; they have to be kept, and if they are to be sold to advantage they must be well fed. Rubbish in the way of food is of little value. They require, for economical growth, the same ration as the pullets. Keep them free from intestinal worms, and dispose of them as early as possible.

In the raising of cockerels for table purposes, particularly heavy-breed cockerels, it is advisable occasionally to examine the breasts for defects. In quick-growing heavy-breed cockerels, blisters upon the breasts are not uncommon. These blisters eventually callus up, and, at times, are responsible for the complete condemnation of the carcase. The perching of heavy-breed cockerels on wire-netting and on rough perches appears to be conducive to this disorder, and if the condition is noticed upon examination some action should be taken to prevent the trouble from becoming general. When such a condition is found it is suggested that the cockerels be given straw to sleep upon if they are being raised upon wire-netting; should they be perching, that the perches be smoothed off and, if narrow, wider ones—say, 3 inches in width substituted. The wider perch may also have the effect of reducing the number of crooked breasts—a feature that also depreciates values.

Crating should receive the attention previously suggested, and a good layer of straw or grass placed on the floor to ensure the stock being in a clean condition on reaching the market. The birds crated together should be alike as possible as regards age, size, and condition, and of the one variety.

WOMEN FARM WORKERS IN BRITAIN.

The number of women employed in agriculture in Britain is increasing to a remarkable extent. This is attributed to the fact that women in the country districts of the Old Land during the past year have been attracted to farming because it is now included among the insurable industries under the National Insurance Scheme. On the other hand, there is a shortage of men for farming work, even at wages well above the fixed rate for farm labour. The revival of the heavy industries as a result of the rearmament policy is probably the reason for this.

Suitable Cotton Varieties for the 1938-39 Planting.

THE bulk of the requirements of the Australian spinners for the coming season will be for cottons of 15/16th to 1-1/16th inch in length. This will necessitate a greater growth of varieties producing these staple lengths than has been the custom in the past. The following recommendations are therefore made to assist farmers who have not grown such cottons before to select the most suitable variety of this type for their soils.

The best variety producing the shorter cottons on the alluvial soils of fair to good fertility in the Southern district and the South and Central Burnett districts appears to be the Half-and-Half, which has yielded very well in these areas during the last two seasons. It has not done well in trials in the Callide Valley, and cannot be recommended for that area. It has a medium-sized boll, which picks well when the variety is grown under favourable conditions, yields cotton around 15/16th inch in length, and has a lint percentage of approximately 40. It should be grown on soils of low moisture-retaining ability, for adverse conditions markedly reduce the size of the bolls and the quality of the lint.

The Lone Star variety appears to be the outstanding cotton for most of the clay loam soils of the lower slopes originally covered with ironbark and box trees of the forest series, and brigalow, brigalow-wilga, and brigalow-belah of the scrub series. For several seasons this variety has yielded satisfactory returns on such soils in the Maranoa, the South, Central, and Upper Burnett, and the Callide Valley districts. It is rather a vigorous grower on fertile loamy soil, however, and should, therefore, not be planted on alluvial loams in districts likely to experience heavy mid-seasonal rains. It has large, well-opened, easily picked bolls, produces fibre from 15/16th to 1-1/16th inch in length, according to soil and climatic conditions, and yields around 36 per cent. lint for the bulk stocks, and up to 38 in some of the newer developed strains.

It is undoubtedly a variety well suited for many of the districts, and should be grown wherever possible, as the lint is in great demand by the spinners.

Another big-bolled cotton that should be grown to the fullest extent is the Miller variety, which has given excellent results on the clay loam soils of the lower forest and scrub slopes, as well as on the alluvial clays of moderate fertility in the Wowan, Callide Valley, Upper Burnett, South Burnett, and Southern districts. It is earlier fruiting than Lone Star and can, therefore, be planted on more fertile soil, but requires greater moisture than does the latter variety, thus making it a better cotton for the heavier soils of the slopes in the coastal areas. The bolls are very large, and are exceptionally easily picked, particularly on cultivations following grassland; the fibre is the fullest bodied of any cotton grown here, and averages around an inch in length, with a 35 lint percentage. As a rule, rather high grades of lint are obtained with Miller, for the fibres clean up well in the ginning operations.

Cliett is a big-bolled variety that competes with Lone Star and Miller under certain specialised conditions, but is not recommended for distribution except where carefully conducted tests have indicated its superiority.

Mebane is a nice type of big-boll cotton that produces excellent fibre on sandy soils overlying clay in the drier districts and on the harder clay melon-hole soil types of the brigalow scrub, where it gives very satisfactory results. It is not suited to the better soil types, however, owing to a tendency to make rank growth on such soils under good rainfall. Under suitable conditions it is a good picker, with a 38 lint percentage, and produces fibre ranging from 1 to 1-1/16th inch in length.

The most promising of the shorter stapled cottons for the fertile alluvial loams are Half-and-Half and New Boykin in the Upper Burnett district, and New Boykin and Ferguson in the Callide and Wowan districts. Ferguson is a quick-maturing type that under favourable conditions produces 15/16th inch to 1 inch cotton of good quality, has a 37 lint percentage and a boll of medium size which opens and picks well. When it is grown on droughty soils under adverse conditions the variety reacts severely, the lint percentage dropping to 35 with the fibres tending to be soft. Care should be exercised, therefore, in selecting suitable soil for this variety. New Boykin has proved itself a very uniform cotton, yielding well in a normal season. The staple length varies from ⅞ inch to 1 inch, and it has a lint percentage of about 37.

It will also be necessary to produce a reasonable amount of 1⅛-inch cotton, and farmers who have obtained satisfactory yields of high-grade cotton with Indio Acala should continue to grow this variety. It is advised, however, that there is little demand for the softer or yellow-spotted grades of these longer cottons, and where growers have received mostly yellow-spotted grades they should resort to the Miller or New Boykin varieties, for apparently their conditions are not suitable for the longer cottons.

It is stressed, though, that there is a bigger factor of safety for obtaining satisfactory yields of cotton of good quality from all varieties during the first three or four seasons following the breaking-up of grassland. After that, the changes in the chemical and physical condition of

the soil that occur with further cotton cultivation make it necessary that the varieties be very carefully selected to suit the soil and climatic conditions.

It is strongly recommended that when in doubt as to the best variety, the farmer should apply for advice either to the field officer of the cotton section of the Department of Agriculture stationed in his district, or direct to the Department of Agriculture and Stock, Brisbane, for a large amount of evidence has been collected as to the merits of the different varieties which would be of assistance in determining the best variety, if the soil type is described.

Cotton Seed Distribution.

THE distribution of cotton seed for the coming planting season is now in progress. For the benefit of farmers intending to order seed who are not acquainted with the details, it is advised that the recommended rate of seeding is 12 lb. per acre for planting in the newly-burned scrub; 15 lb. delinted and 20 lb. fuzzy seed per acre in the cultivations. The cost of seed, including freight to the grower's nearest railway station, is 1d. per lb. for fuzzy and 1½d. for delinted. Applications for seed, accompanied by a remittance at the specified rates, should be sent to the general manager of the Cotton Board, Whinstanes. A description of the soil type should also accompany the order to assist in selecting the most suitable variety for the conditions.

Judged by the ratio of delinted to fuzzy seed issued to date, it would appear that many growers are not fully aware of the advantages of planting delinted seed. Carefully conducted tests at the Cotton Research Station have indicated that, except where planting in the dry soil is practised, the use of delinted seed has marked advantages over the fuzzy seed. The removal of the fuzz allows the seed to absorb soil moisture more quickly, thus speeding up germination and enabling a strike to be obtained on a light storm. This is a decided asset, for frequently a grower may have a well prepared seed-bed with an ample supply of moisture below the surface and yet may not dare to plant fuzzy seed following a light storm, as germination would be so slow that the effect of the storm would be lost before a full stand could be obtained. By using delinted seed a gain in germination of fully forty-eight hours would be effected, which would be ample to give the seedlings the benefit of most of the surface moisture, and thus allow them to penetrate into the good supply of moisture stored up in the lower layers of the soil from earlier rains.

The removal of the fuzz is also of value in the planting operations, in that the seed is more uniformly spaced than is the case with the fuzzy seed. Fuzzy seed tends to cling together and come through the planter in bunches, and it is necessary to plant more seed than is actually required in order to obtain a full stand. By using delinted seed a

lighter rate of sowing—12 to 15 as compared to 18 to 20 lb. per acre—is sufficient to produce a good stand, and, in addition, reduces the competition for moisture between the seedlings, because of the more uniform spacing, which enables them to withstand adverse conditions to much better advantage. Likewise, the lighter and better spaced stand obtained with delinted seed is of value to the farmer where thinning has to be delayed unavoidably, for the plants will be able to develop reasonably well past the correct stage for thinning.

Another advantage of delinted seed is that it can be sown with the ordinary maize planter equipped with the usual six-hole seed plate, having holes three-eighths of an inch in diameter with only slight adjustments to the machine, whereas the fuzzy seed requires special cotton seed attachments for the planter. Full details of such adjustments may be obtained by writing to the Department of Agriculture and Stock.

Growers planting in the newly-burned scrub areas immediately after planting rains should also use delinted seed, for it is suitable for the walking-stick hand planters, without any of the treatments that are required to paste down the fuzz of the undelinted seed. Sufficient evidence has not been collected yet as to the merits of the delinted seed for planting in the dry ash, as is often done by growers of large acreages of cotton in the newly-burned scrub areas. It is possible that treating the fuzzy seed in a manner to paste the fuzz down so that the seed will run freely through the planter may be the best system for dry planting, as considerable rain is required to wet up the ash sufficiently to enable a strike to be maintained. The delinted seed might germinate on light rains, whereas the treated seed would require greater rainfall, which would ensure better conditions for the resultant seedlings.

Where planting in the dry soil of the cultivations is intended, it is better to use fuzzy seed, for it does not germinate if light showers of around 20 points of rain are experienced after the seed is in the dry soil. Planting in the dry soil has merits where a large acreage is to be sown, but also has definite drawbacks, especially on old cultivations, where the physical condition of the soil may be such that the surface sets badly following heavy rain. In such cases it is very difficult to obtain a good strike from dry planting, and growers have to replant their whole acreage in some seasons. It is recommended, therefore, that only the portion of the acreage that cannot be planted within three days after the planting rain be dry planted. Under such a system, the grower has a good chance of obtaining a satisfactory strike over all his area with the first good planting rain, without running the hazard of having to replant the whole of his acreage in the event of a heavy cold rain rotting all the dry planted seed. If such a rain does occur, under the recommended system, a good strike should be obtained from the area planted after the rain, thus leaving only the dry planted portion to be replanted following the next rain.

Poona Pea as a Green Manure Crop.

THE Poona pea belongs to that class of legumes commonly known as "cowpeas" and more particularly to the *catjang* or Indian cowpea group. The origin of the name "Poona" is obscure; this is not used overseas, but it appears probable that the introduction was made from Poona in India and that the term was used to describe this particular variety of cowpea. It was introduced into Queensland a good many years ago and in later years has enjoyed a remarkable rise to favour as a green manure crop in North Queensland. At the present time in the far north it is probably planted to a greater area than the combined areas of all other green manure crops. The reasons for this expansion are—(1) the small cost of seed, one bushel costing approximately 15s. being ample for the broadcast seeding of 3-4 acres; (2) quick and certain germination; (3) ability to produce a heavy crop on poorer lands.

Although the Poona pea may take longer to attain maturity than, say, the Groit bean or the black cowpea, nevertheless it must be regarded as a quick maturing crop and may usually be ploughed in some 10-12 weeks after planting. It is a prolific seeder and for that reason must be ploughed in when the seeds are in the milk stage, otherwise some trouble may be experienced later.

The Poona pea is rich in protein and makes an excellent stock food either cut and fed green or when stored as hay; it is widely used by dairy farmers in Southern Queensland. We have not had much experience of the ratooning of this crop but have observed several instances of excellent ratoons being produced; for this purpose it would appear necessary to cut the crop early, before the first seed has set. In some instances the plant crop has been used for fodder and the ratoon crop ploughed in for green manure purposes. (See Plate 73.)

Unfortunately this otherwise excellent plant is rather susceptible to a wilt disease which attacks it in wet weather. The stem of affected plants starts to discolour and wilt a few inches above ground level; the infection then extends down to the roots and the plant eventually dies. This wilt spreads very rapidly in the wet season and a whole planting may be destroyed in a short time. Although it generally commences

in the wettest portions of fields its spread appears to be mainly dependent upon continued wet weather and it has been observed on every type of soil, including well drained hillsides. In areas where this wilt persistently occurs it would be advisable to plant the Groit bean or the giant, black, or victor cowpea.

Plate 73.

Poona pea grown on the farm of F. J. E. Holt, The Cedars, Mackay. The three plants on the left represent the plant crop, and the three on the right the ratoon crop from portion of this plant crop. The older plant crop plants have naturally become woody and defoliated, but it will be seen that the ratoon plants have grown better even with the shorter growth period.

As in the case with all legumes, Poona pea has the faculty of working in association with nitrogen-fixing bacteria and obtaining its supplies of nitrogen from the air and not from the soil. Consequently when such a crop is ploughed in the nitrogen content of the soil is considerably enriched. These nitrogen-fixing bacteria carry out their work in small nodules attached to the roots of the growing plant. It should be pointed out that these bacteria will not carry on with nitrogen fixation if there is plenty of nitrate available in the soil and thus no additional stocks of nitrogen will be accumulated. From this point of view therefore it is desirable to plant the green manure soon after harvesting and ploughing out, when the nitrate supplies of the field are low. By the same token it should be borne in mind that if nitrates are plentiful it is possible to grow an excellent crop of Poona pea without the formation of a single nodule—but in such a case all the nitrogen will have come from the soil and not from the air.

Particular strains of these nitrogen-fixing bacteria are specific to particular groups of plants while, in addition, one strain may be much more efficient than another strain which works in the same plant. Consequently, in order to ensure that efficient strains will be present in the soil, modern agricultural practice aims at the planting of suitably inoculated seeds of legumes. In Plate 74 will be seen the advantage gained from

the inoculation of Poona pea with a highly efficient strain of bacteria as compared with a less efficient strain. Cultures of this efficient strain are maintained in our Pathology Laboratory in Brisbane and can be made available to cane growers at a nominal charge. Application, accompanied by a postal note or stamps to the value of 1s., should be made

Plate 74.
Poona pea plants grown in sterilized sand. No. 7 inoculated with a good strain of nitrogen-fixing bacteria. No. 8 medium strain, No. 9 not inoculated.

to the Director, Bureau of Sugar Experiment Stations, Brisbane, at least three weeks before the proposed planting; in making such applications the weight of seed to be planted should be furnished. The process of seed inoculation is very simple and rapid, and full instructions will be issued with each culture.

—*A. F. B. and G. B. in The Cane Growers' Quarterly Bulletin.*

FERTILIZER "BURN."

A severe case of fertilizer burn has been brought to our notice in the Mulgrave area, where a field of D.1135 failed to germinate and had to be ploughed out and replanted. The damage can be attributed directly to the method of application rather than to the type of fertilizer used. In planting, a combined driller, planter, and fertilizer machine was used, the fertilizer being dropped immediately on top of the plant. The result was that the young, tender roots were burnt and the set failed to grow.

The Bureau has always recommended placing fertilizer in the drill with the plants, but at the same time advises this to be put in the bottom of the drill and under the plant.

It is not suggested that applying fertilizer on top of the plant will always cause trouble, but nevertheless it has been proved that under certain conditions a complete failure in germination may result. In the case under review only 4 cwt. of fertilizer per acre was applied, and while soil moisture was ideal at the time of planting, dry conditions followed. The rows without fertilizer gave almost 100 per cent. "strike."

—*G. B., in The Cane Growers' Quarterly Bulletin.*

Cane Grub Control in the Isis District.*

R. W. MUNGOMERY.

WHILST investigating the progress of the Giant American Toad in the Isis district in the early part of the present year, attention was paid to the cane grub pest and, although no detailed survey could be carried out in the time available, it seemed evident that the pest had not increased markedly (if at all), over the general infestation of previous years. Odd patches of grub-damaged cane were to be seen in various localities, and grubs were even bad in paspalum pasture land where they had killed out patches of grass, but this has been a feature of previous infestations too; the standover crops do not appear, as yet, to have given the pest any great impetus to increase abnormally. However, the standing over of crops and longer ratooning, and their general effect on the increase of the grub pest, will have to be watched carefully over a number of years to ensure that these practices are not unduly influencing the building up of denser grub populations. Where grubby patches occur in ratoon blocks of cane, growers are warned against the practice of allowing this cane to stand over, since the combined influence of both grubs and dry weather often reduce the final yield much below the tonnage which could have been harvested if the block had been cut as a normal one-year crop.

It is pleasing to note that some of the larger estates, which in previous years suffered such heavy and widespread infestations, are now comparatively free of the pest. It is true that patches of grubs occur from time to time in different blocks, but the infestation is not on such a huge scale as previously. This changed status of the grub pest appears to be due to the system of using the high-speed rotary hoe and eliminating spring planting. When blocks are being prepared for planting they are given two high-speed rotary-hoeings during summer months, when the majority of the grubs are located in the upper soil levels. To get the maximum benefit from these operations it is best to carry out this work when the soil is reasonably moist. These two operations should also be spaced at an interval of six weeks to two months in order to ensure that any grubs which are below the depth to which the implement works on the first occasion, will almost assuredly lie within its range at the second working, when they move up near to the surface. Dry soil conditions tend to make the grubs retire deeper in the soil, hence the undesirability of carrying out this work when the soil is in that state. After the first rotary-hoeing a grubber can sometimes be worked through the block with advantage, as this allows the hoes of the implement to cut more deeply during the second operation.

These operations account for a large percentage of grubs and, when planted to cane in February or thereabouts, the block then starts off with a very low grub population and, in typical grub-infested areas, it can usually be expected to remain reasonably free of the pest until the second ratoon crop.

Such a system of grub control, involving the use of expensive tractor equipment, was necessarily limited in previous years to those large plantations which could afford such heavy overhead expenses as this equipment involves. However, we understand that a high-powered unit now operates in the Isis district on contract work and although we have not had the opportunity of checking the grub mortality behind this machine, reports indicate that it is much in advance of the ordinary type rotary hoe commonly used by growers.

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1938.

The more widespread adoption of this form of grub control seems to be a definite forward move and it has much to commend it over the more tedious, costly, and less efficient method of single furrow ploughing and hand-picking.

THE CULTIVATION OF GRAIN SORGHUMS.

The production of grain sorghum as an alternative to maize in the drier farming areas is well worth consideration when planning cropping programmes. There is no doubt that suitable varieties of grain sorghums will yield profitably under seasonal conditions which are usually unsuitable for maize grain production.

Friable medium heavy loams will produce the heaviest yields, but satisfactory crops can be grown on average wheat lands throughout the Darling Downs, Maranoa, and the agricultural districts of Central Queensland. The best results are obtained from thoroughly cultivated winter-fallowed land.

Grain sorghums may be sown through standard grain drills, either in rows 3 feet to 4 feet apart, permitting of inter-row cultivation, or through every grain run or every second grain run of wheat drills. When sown in the wide-spaced rows, 4 to 5 lb. of seed per acre are usually necessary, although satisfactory stands have been obtained with a seeding rate as low as 3 lb. per acre.

Of the tall-growing varieties, Feterita and Standard Milo have given the best results, Blackhull Kafir and White Milo also being satisfactory types.

For large-scale production of such varieties it is usually necessary to harvest with a maize binder prior to curing, carting, and threshing.

Small areas can be headed with a cane knife and carted direct to the barn, subsequently passing the heads through a thresher or corn sheller suitably adjusted for the purpose.

The dwarf-growing varieties, however, offer the greatest opportunity for economical production within the wheat areas, as harvesting can be successfully undertaken with header-harvesters, reaper-threshers, or autoheaders.

During the 1936-37 season, when maize crops on the Downs failed generally, small areas of Wheatland Milo, Brown Yolo, Kalo. Day Milo, and Dwarf Pink produced marketable grain, the yields varying from approximately 6 to 50 bushels per acre, according to seasonal conditions in the district concerned, three growers harvesting with standard grain-harvesting machinery. As grain sorghums can be relied on to produce heavier yields than maize during any season, the fact that machine harvesting is now possible should greatly enhance their popularity.

In some districts bird pests are very troublesome, but with increased areas these probably would prove less serious.

Regarding food value, the grain sorghums are little inferior to maize. Feeding tests carried out in the United States of America have indicated that grain sorghums had approximately 90 to 95 per cent. of the feeding value of maize for fattening cattle, pigs, and lambs. The protein content of grain sorghums is generally higher than that of maize.

—*H. W. Ball.*

Grub Control in the Burdekin District, 1937-38.*

H. G. KNUST.

THE following notes on cane grub control in the Lower Burdekin have been compiled from observations made during visits to this district in 1937-38:—

The repeated heavy waterings of cane lands in the Burdekin District does not appear to have any definite effect on the time of emergence of the greyback beetles, as is instanced by the fact that beetles did not emerge until after the copious rains which occurred at the end of last November. Following these rains large emergences occurred in various parts of the district where grub infestation had been great and destruction considerable earlier in the year; emergence occurred from the cultivated lands, and it was not until later rains occurred, in late January and early February, that beetles emerged from the grassed and timbered lands.

Collection of beetles under the Burdekin conditions would, in my opinion, be a very unsatisfactory method of control; feeding trees (Black Palm, Bloodwood, Moreton Bay Ash, and Ti-tree) occur throughout the district and are numerous in the large areas of forest lands within and adjoining the cultivated lands. Under these conditions only a small percentage of the beetles could be collected, and a sufficient number would be left to cause considerable damage. Destruction of any small areas of feeding trees within the cane areas should reduce the grub population adjacent to these areas, but destruction of the larger areas is, I consider, a very big undertaking and may not be beneficial.

Apparently, continued favourable weather conditions have been responsible for a low mortality of grubs and beetles, and this year we find that grub populations per infested acre are high, ranging from an average of 3 to 14 grubs per stool. Fumigation has been practised this year, and the results accruing therefrom should be beneficial.

When fumigating careful supervision has to be maintained for the following reasons:—

1. Some soils appear to hold the moisture longer than others and cracking of the soil occurs, quite soon after rain, in some situations. When cracking occurs water has to be applied to make the soil suitable for fumigation.
2. The water furrows between the rows of cane, and the application of water to these furrows does not force an early concentration of grubs at the base of the stool but rather tends to keep the grubs scattered for a longer period, and the grubs appear to favour the root growth in these furrows.
3. Where grubs concentrate at the base of the stool they feed from 4 to 10 inches below the surface, due to the necessity for heaping soil against the stool to create water furrows and the consequent burying of the stools.

* Paper contributed at a Conference of Cane Pests Destruction Boards, held at Meringa, on 25th May, 1938.

It is my opinion that, with the assistance of the weather conditions peculiar to the Burdekin District, fumigation will considerably reduce the grub-infested areas, but small areas of cane lands immediately adjoining the large areas of forest lands will have to be continually watched and fumigated if necessary.

SUMMER FODDER CROPS IN THE MARANOA.

The possibilities of summer hay and fodder crops for early spring planting, if the weather is favourable, are now engaging the attention of farmers in the Maranoa district. Land for such crops should, of course, be prepared now. Ploughing may be impracticable until it rains, but there are many paddocks already prepared for wheat which could not be sown during the dry weather. When replanting these areas it would be advantageous to reserve at least a portion of the area for summer fodder crops.

Pre-eminent among the fodders suited to the district is Sudan grass. The risk of prussic acid poisoning associated with this crop can be reduced by purchasing seed from a reliable source to ensure freedom from contamination by the more toxic sorghums. Careful grazing is also necessary. Stock should not be fed on young crops, or crops which have been checked in any way during growth. It is also inadvisable to turn hungry cattle into a Sudan grass paddock.

Good-quality hay can be made from Sudan grass in the Maranoa, and it constitutes a valuable standby for all stockowners during winter or other dry periods. Fine-stemmed plants are preferred by stock, and facilitate both harvesting and curing the hay. For this reason, wide drills which strain the cutting mechanism of a mower or binder and tend to develop coarse plants should be avoided. Planting with the wheat drill, at the usual spacing for wheat, gives excellent results if the seed is sown at the rate of 7 lb. per acre.

As a quick-growing crop Japanese millet is coming into wider cultivation on the better loams of the eastern portion of the district. The crop may be grazed when quite young, and in feeding off there is no risk of stock poisoning. For best results, however, it is wise to allow growth up to 9 to 12 inches. The hay is good, although yields are not so heavy as Sudan grass; 10 to 12 lb. per acre is the usual sowing.

West of the Darling Downs cowpeas are not in general use for fodder or hay, although they do well enough on the lighter soil types, and form a very useful supplement to other fodders. Stock often show a dislike to the fresh green growth when they are not used to it, but eat it readily when cut. The value of this legume in supplying a protein supplement when fed with native pasture, and its capacity to enrich the soil through the action of nitrogen-fixing bacteria in the nodules of the roots should not be overlooked—particularly in sandy soils where native legumes are of little consequence.

Broadcast sowings of half a bushel are usually made with small-seeded peas such as Poona. In rows, 8-10 lb. of seed is sufficient.

—*C. H. Defries.*

French's Cane Beetle.*

J. H. BUZACOTT.

AT the end of last year some consideration was given to fumigation as a means for controlling grubs of the cane beetle *Lepidiota frenchi*. Observational plots were established on a neighbouring farm in order to determine whether economic results might be obtained by the use of the following fumigants:—Carbon disulphide, carbon disulphide + para-dichlorbenzene (1 : 1 mixture), and carbon disulphide + ortho-dichlorbenzene (2 : 1 mixture).

At the time of fumigation the grubs had already caused severe damage in patches throughout the block of cane. Rows were selected where the cane was wilted but not dead. The standard dose of 4·6 ccs. was used, and four injections were made at each stool placed approximately 6 inches deep in the soil, which was very dry at the time.

Fumigation was carried out on the 22nd November. On 1st December considerable wilting of heart leaves had occurred in stools treated with ortho-dichlor and para-dichlor mixtures, whilst there was no apparent difference between controls and stools treated with carbon disulphide alone. Later inspections showed that the stalks of the orginal stools died out when fumigated with the mixtures, whereas no damage occurred by using carbon disulphide on its own. The stools damaged by the mixtures grew new shoots—that is, they virtually ratooned—but, of course, their growth did not attain that of the undamaged stools in the control and carbon disulphide-fumigated plots.

When examined during April, 1938, it was apparent that no advantage had been gained by the fumigation; the rows fumigated with disulphide looked no better than those which were left as controls, and those fumigated with the mixture were still comparatively stunted. Considering the dryness of the season surprising growth had been made by the grub-damaged cane and, except where the stools had actually been killed by the grubs, they had made an excellent recovery.

Considered from every point of view, fumigation would not appear to be a practicable method for dealing with frenchi grubs. In the first place, it would be necessary to dig the fields before damage commenced to show, in order to determine which portions to fumigate. This would involve digging to a great depth, and even were this done the erratic manner in which frenchi grubs come up from the deeper layers of soil in order to recommence feeding would render fumigation a doubtful proposition. Particularly is this so in a dry year, and it must be borne in mind that it is in dry years that frenchi grubs cause more severe damage. In years with a well-distributed rainfall the cane is able to make roots sufficiently rapidly to withstand the attacks of the grub.

At present the best recommendation seems to be to pay attention to thorough cultivation and not ratoon too long, as ratooning allows the pest to build up large populations.

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* Paper contributed at a Conference of Cane Pests Destruction Boards, held at Meringa, on 25th May, 1938.

SEED POTATO SELECTION.

The problem of obtaining suitable seed potatoes for the early crop confronts most growers every year. This seed must necessarily come from southern sources, and, although the regulations demand that the bags must clearly bear the name of the variety, attention is called to the risk of buying seed of inferior quality. On most farms it is a common practice to grade out all undersized tubers and sell them as seed. This means that the weakest and least prolific strains of the variety are included and the risk of a poor return is obvious. Much can be said in favour of purchasing larger potatoes and cutting them into sets, as this largely eliminates the danger of rubbish being planted.

It is false economy to cut the sets too small, as they serve as a reserve food supply for the plant during the early stages of its growth. Small sets soon become exhausted and the growing plant fails to receive the necessary assistance. This check hinders normal growth and handicaps the plants in the formation of tubers. Sets should not be allowed to dry out more than can be helped before planting.

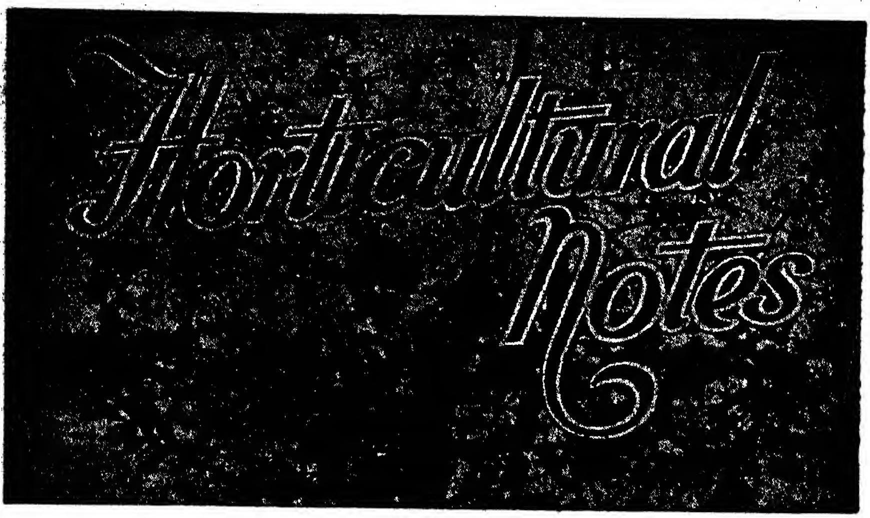
For the late crop, round seed is recommended and most growers manage to reserve their own requirements. The practice of selecting this seed at the time of harvesting from the most prolific plants is well worth the extra trouble.

THE HEMP PLANT—INFORMATION SOUGHT.

Considerable press publicity has been given recently to the supposed occurrence in Queensland of the Hemp plant (*Cannabis sativa*), and statements have been made that it occurs in various parts of the coast, both in North Queensland and in the South-Eastern districts.

The Department is very anxious to confirm, or otherwise, these accounts, and to enable people in the country to recognise it, the following description is offered:—

Cannabis sativa is an upright plant, 3-10 feet in height. It is rather stout in growth, and holds its branches nearly upright. The inner bark is fibrous and very tough and strong. The whole plant is rough-hairy, and is strongly scented. The leaves are compound, and are composed of 5-7 slender leaflets, radiating out like fingers from a common base. The individual leaflets vary from 3-6 inches in length, and from ¼ to 1 inch wide. They are pointed at both ends, and are sharply toothed. The male and female flowers are borne on distinct plants. The males are formed in large compound panicles. The female or fertile flowers are borne in small spikes in the leaf axils. They bear a number of small seed-like nuts, about ⅛ inch long. It contains a powerful drug, which is used in medicine, and in parts of Asia and Africa to produce narcotic effects somewhat similar to opium. The plant has been grown in an experimental way on account of its fibre in Queensland at odd times, but the Department has no record of its occurring wild. It occurs wild, or semi-wild, to a limited extent in parts of New South Wales. Anybody who sees a plant they take for Hemp is asked to forward specimens for identity to the Department of Agriculture and Stock. The specimens may be sent, either to the Under Secretary, or to the Government Botanist.



Spraying Recommendations for the Control of Citrus Diseases.

F. W. BLACKFORD, B.Sc.Agr., Assistant to Research Officer.

DURING the citrus season just closing, surveys have shown that many growers are suffering losses from diseases which may be checked by the application of suitable sprays in the early part of the season. The most important of such diseases are black spot, melanose, scab, and brown spot of the Emperor of Canton mandarin. Each of these diseases causes serious blemishes on the rind, thus detracting from the appearance of the fruit with a consequent lowering in value. The presence of either black spot or brown spot may also result in direct loss due to premature fruit fall.

Observations show that there is a varietal resistance to certain of these diseases. Brown spot is restricted to the Emperor of Canton mandarin. Melanose, on the other hand, affects nearly all varieties of citrus. Scab is particularly severe on lemons and, to a less extent, on mandarins, while the orange is immune. Late Valencia oranges and lemons are most seriously affected by black spot. Common oranges, mandarins and grapefruit mature early and may be picked before this disease develops. If allowed to hang on the trees late in the season infection may be severe.

Experiments have shown that in all the diseases mentioned, infection takes place from the time the fruit and leaf tissues are very young. The fruit may remain susceptible to black spot for three or perhaps four months after setting. In the case of melanose and scab this period is a little shorter. Brown spot, however, is capable of infecting the fruit throughout the season. In many cases, the infection may remain dormant for a considerable period, and the symptoms appear only as the fruit approaches maturity.

Based on the foregoing observations effective spray schedules for the control of these diseases have been developed. The latest recommendations for use under Queensland conditions are given below. It is necessary to stress the importance of spraying early at the correct time. Late spraying is usually ineffective.

Black Spot.

Spray with Bordeaux mixture (3-2-40) to which 1 per cent. (approximately ½ gallon in 40 gallons) spraying oil, well emulsified in its own volume of water, has been added as a spreader, at the following times:—

(1) When half to three-quarters of the blossom has fallen.

(2) About two months later.

Melanose.

Spray with Bordeaux mixture (3-2-40) plus 1 per cent. spraying oil immediately all the blossom has fallen. This spray may be applied earlier if it is desired to control black spot or scab as well, but should not be later than the time mentioned.

Scab.

Spray with Bordeaux mixture (3-2-40) plus 1 per cent. spraying oil when half to three-quarters of the blossom has fallen.

Brown Spot of the Emperor of Canton Mandarin.

Spray with home-made colloidal copper (3 gallons of stock in 40 gallons of water) at the following times:—

(1) When half to three-quarters of the blossom has fallen.

(2) Two months later.

(3) In late February.

As the use of Bordeaux mixture, under certain circumstances may lead to an increase in the infestation of scale insects, special steps may have to be taken for their control when this spray is used. Colloidal copper does not appear to possess this disadvantage to the same extent, and although the efficiency of this spray has not been demonstrated except in the case of brown spot, there is reason to believe that, where desired, it may be substituted for Bordeaux mixture in all the schedules.

From a consideration of the above schedules, the following fungicide programme is suggested for use in Queensland citrus orchards. One, two or three applications will be required according to the varieties grown and the diseases concerned.

The first spray may be applied to all varieties in the orchard and is necessary for the control of all four diseases. It should consist of Bordeaux mixture (3-2-40) plus 1 per cent. oil or home-made colloidal copper (3 in 40) and be applied when half to three-quarters of the blossom has fallen.

The second spray is necessary for the control of black spot and brown spot and should be applied to late Valencias and lemons and, where brown spot is prevalent, to Emperor mandarins. Early oranges, grapefruit and mandarins may be included also where black spot has proved severe. This spray, consisting of Bordeaux mixture (3-2-40) plus 1 per cent. oil or home-made colloidal copper (3 in 40), should be applied two months after the first spray.

The third spray is required only in those districts where the Emperor mandarin is affected with brown spot. It should consist of home-made colloidal copper (3 in 40) and should be applied in late February.

In the drier inland citrus districts it may be possible to effect control of black spot with the blossom spray only.

Selection and Care of Scions for Grafting Deciduous Fruit Trees.

H. COLLARD, Instructor in Fruit Culture.

TOO much care cannot be bestowed on the selection of scions to be used for grafting. Just as the grower expects to receive good trees from the nursery, so should he, in proposing to rework trees, take care to see that his scions are the best procurable, for the life of a reworked tree should be, if the job is done properly, just as long or even longer than if it had not been regrafted.

The scions should be obtained for preference when the wood is quite dormant, and, since "like begets like," they should be taken from selected trees that are healthy in all respects and, if possible, proved good croppers, or they may be taken from reworked trees the scions of which had been in their turn carefully selected.

Scion wood can be taken from anywhere in the tree, but it should be but one year old—that is, of the previous season's growth and with apples and pears free from flower buds. With stone fruit, this is not always possible, because, in addition to the simple wood buds, they usually have multiple buds—i.e., both flower and a wood bud at the one location; this does not matter, because the outside flower buds will fall off, leaving the dormant wood bud in the middle.

Medium-sized wood is the best. Overgrown, coarse growth with long internodes should be avoided. Small thin growth also is undesirable.

As the grower usually has plenty of wood to select from, he can easily see that he has only the right material. If he has not, then he should get it from a neighbour, rather than attempt to use unsuitable material. The grower should see that he has plenty of scions and he will find it advisable to allow for only one scion out of each wood stick. Assuming the wood sticks are about 18 inches long, the grower will usually find that with the bottom 4 inches the buds are poorly developed. The top 6 inches are too thin and the buds immature, leaving but 8 inches of the most suitable wood in the middle of the stick, out of which it is often hard to cut more than one scion. This applies to scion wood other than the peach or nectarine, which is an exception, because in grafting these fruits it is desirable, if the top portion of the scion is of sufficient thickness, to leave the terminal intact.

In grafting, the principle is to graft a dormant scion on to an active stock and then when the sap flows from the active stock into the dormant scion, it brings the dormant buds of the scion into life and growth commences immediately.

Some growers experience difficulty in keeping their scions dormant, but they will have no trouble if they go about it the right way.

The scions kept should not be merely an armful of prunings of the required variety buried in a trench in an orchard, some times without even a stick to mark the site, which often means hunting for hidden treasure when the day for grafting arrives. They should first be tied into neat bundles of from forty to fifty scions to a bundle, labelled correctly as to variety and then buried, so that from a third to a quarter

of the scion is in the ground and two-thirds to three-quarters above ground.

Choose for the site a place where they have a reasonable amount of moisture, but as little sun as possible, because it is the warmth of the soil that starts them into life. The south or south-westerly side of a building is a good site.

If the grower experiences difficulty in keeping the scions back because of his having a lot of grafting to do, and so that the period has to be prolonged, then he should dig them up one evening, leave them out all night, and replace them in the soil in the morning. This will act as a check without harming them in any way.

With scions of stone fruit, should the flower buds commence to swell or even come into blossom, the grower should not jump to the conclusion that they are too forward, because, on examination, it will usually be found that the wood bud which is situated in between the flower buds is still dormant. It is when the wood bud commences to shoot that they are too forward. Should the scions show signs of withering through insufficient moisture, they should be buried entirely in a moist place for some days. On no account soak them because this will cause the buds to absorb a large quantity of water, which soon dries out again and there is a grave risk of the buds falling out.

When the time for grafting comes and the scions are dug up it will usually be found that callus formation has started at the bottom—this is a normal provision of nature. Should some of the scions have failed to form this callus, however, they should be discarded, because usually there is something wrong with them.

Some growers are inclined to start grafting too soon. This is inadvisable. It is much harder to perform the operation if the sap in the stock is not running freely. In the Stanthorpe district it will be found that the best time to start is in the last week in August or the first week in September for stone fruits, and for apples and pears a month later. The period can be extended to so long as the scions remain dormant.

With grafting there are three essentials:—(1) Healthy trees; (2) good scions; (3) good workmanship. If any one of these three is lacking, then the result must be a failure.

Officers of the Department of Agriculture are in Stanthorpe to assist growers, and should anyone be in any doubt as to whether his trees are suitable for grafting, he should get in touch with the officer-in charge who will advise him as to their suitability or otherwise, and the best grafting methods to adopt according to the circumstances.

Further, should a grower be in any doubt as to his own capabilities as a grafter of trees, then the Departmental officers will be pleased to give him the necessary instruction. It is at times hard to understand how some growers, who have but a very hazy idea of grafting, have so little compunction in cutting down perfectly good trees and, through ignorance, spoiling them for all time when an hour or two's tuition would enable them to do the work correctly and without doubts as to its success.

A pamphlet, "Propagation of Fruit Trees," dealing with this and many other points in orchard practice, is available on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

WATER MELON GROWING.

C. N. MORGAN, Fruit Branch.

THREE essential requirements for successful water melon production are a warm climate, a reasonably fertile soil, and abundant water. Owing to the latter necessity, commercial production is practically limited to coastal districts, although inland, good crops can be grown where irrigation is available. The most suitable soils are those of a sandy loamy nature, to which has been added a fair amount of organic matter, preferably animal manures where these are available.

An application of artificial fertilizer worked into the soil a week or so before planting also is desirable, and the following is recommended per acre:—

1½ to 2 cwt. sulphate of ammonia.

3 to 4 cwt. superphosphate.

1½ cwt. sulphate of potash.

The land should be deeply ploughed during the winter, and properly broken down ready for planting in the spring. In the southern part of the State, August and September are the best months to plant, though seed sowing may be carried on until December. Futher north, planting may commence in July.

Seed may be planted singly about 1 inch deep and 2 feet apart in rows about 4 feet 6 inches apart, or three or four seeds may be planted together in "hills" made about 6 feet apart each way. Two pounds of seed are required to plant an acre.

Rotation of crops must be practised with melons, which should not occupy the same ground for at least two years in succession.

When the main runners are 4 to 6 feet in length, or when the first flower drops and the fruit starts to set, the tips may be cut off to induce the vines to branch. In no case, however, should the pruning be done closer than two or three joints from the nearest flower or setting fruit. Whilst the vines and fruit are growing, they must be kept well watered, and if the weather is excessively hot it is advisable to cover each melon with a handful of straw. When the fruit begins to ripen, the water supply may be cut off.

Water melons take three to four months from seed sowing to maturity.

Difficulty is often experienced by new growers in determining when a melon is ripe and ready to pick. Some experts can tell by giving the fruit a slight crushing, when the creaking of the breaking flesh inside will indicate ripeness. Apart from this, there are two sure ways of testing for ripeness. When the little tendril on the vine near where the fruit breaks away begins to wither, it indicates that the fruit is ripening; but when the tendril at the next joint of the vine also dies, the melon is ripe.

Another test is to turn the melon over and examine the skin which has been in contact with the ground. At first that part is white, but as the melon ripens it turns a darker colour.

Some good varieties are—

Early Yates.—Extra early maturing, medium size, good cropper, light mottled green colour.

Kleckley Sweet.—Long dark green, medium to large size, excellent flavour.

Tom Watson.—Large dark green, good carrier.

Cuban Queen.—Very large long melon, good carrier.

CODLING MOTH CONTROL EXPERIMENTS.

During the 1937-38 season, experiments were carried out in the Stanthorpe district to determine the relative efficiency of certain spray schedules for the control of codling moth and to provide information on the seasonal activity of the pest. The results are summarised below.

In an orchard spraying trial at the Summit, three spray schedules proved as effective as one in which lead arsenate was used for both calyx and the several cover sprays. These schedules are:—

1. A lead arsenate calyx spray (2½ lb. powder to 50 galls. of water with an appropriate spreader) followed by white oil cover sprays (1⅓ gal. white oil to 80 galls. water);

2. White oil—nicotine sulphate (1⅓ gal. white oil, 1 pt. nicotine sulphate and 80 galls. water) applied in both calyx and cover sprays;

3. Nicotine sulphate with sufficient white oil to facilitate spreading (1 pt. nicotine sulphate, 1 qt. white oil, 80 galls. water) applied in both calyx and cover sprays.

Schedules 2 and 3 excluded lead arsenate altogether but there are clear indications that, had lead arsenate been used in the calyx spray and the alternative sprays restricted to cover treatments, the results would have been even better. Lead arsenate should therefore always be applied as a calyx spray no matter what sprays may be used later in the season. Either white oil or white oil plus nicotine sulphate are satisfactory cover sprays which should eliminate the lead arsenate deposit risk incidental to complete reliance on lead arsenate for the control of codling moth.

Schedule 3 is based on a new spray formula, the value of which must be confirmed in further tests before its usage can be recommended.

Potash soft soap, employed in the experiment for calyx and cover sprays at a strength of 10 lb. in 80 galls. of water, gave little or no protection against codling moth.

Lure traps showed that moths appeared in the orchard in a series of waves of varying intensity. The number of eggs laid is consequently greater at some times than at others, and marked improvements in codling moth control can be expected if cover sprays are timed in relation to these peaks in moth activity. Growers should therefore maintain a series of approximately 15 lure traps in the orchard, recording the number of codling moths caught at regular intervals twice a week. Cover sprays can usually then be applied to the trees between the fifth and twelfth days after recorded peaks of moth activity as determined by the lure traps. Vinegar and water (1-12) or molasses and water (1-12) are good lures. Growers should however make contact with Departmental officers at Stanthorpe if detailed information concerning methods of trapping or the timing of cover sprays is required.

For the coming season apple and pear growers at Stanthorpe should therefore use lead arsenate as a calyx spray and either white oil (1⅓ gal.-80 galls.) or white oil—nicotine sulphate (1⅓ gal., 1 pt., 80 galls.) as cover sprays, timing the latter with the assistance of lure trap data when and where possible.

—*K. M. Ward.*

WHITE ANTS AS PESTS OF FRUIT TREES.

Although usually associated with injury to structural timbers, white ants are a source of considerable worry to fruit growers, particularly in dry inland districts where irrigation facilities are available. In established orchards, these insects excavate tunnels within the trunk of the tree or the stem of the vine as the case may be, the tissue destruction ultimately causing irregular bearing and frequently the death of the plant. Young trees or vines may also be attacked, but the insects then work more or less superficially on the stem just below ground level, the runways being built over the bark.

Losses in citrus and grape vines, commonly grown in inland areas, are frequently of economic importance and the injury is not normally detected until the ill effects are visibly apparent in the yellowing of the foliage and the lack of vigorous new growth.

Control measures can be grouped into two categories, preventive and remedial:—

(*a*) Preventive.—White ants subsist for the most part on wood or similar vegetative materials. When land is first cleared for an orchard stumps should be removed and roots run to their extremity. Otherwise, the white ant population in the soil will persist until such time as the residual roots are completely disintegrated and any plants grown may be attacked. The removal of trees, stumps and roots on the site of proposed new orchards is desirable therefore, not only for cultural reasons, but also to minimise the risk of future white ant attacks.

(*b*) Remedial.—In established trees, obviously infested with the pest, $\frac{1}{4}$-inch or $\frac{3}{8}$-inch auger holes which penetrate to the white ant tunnels should be made in the trunk at various heights above ground. A small quantity of Paris-green—an arsenical dust—is then blown through the openings by means of a bulb blower with a suitably narrow outlet, and the holes are subsequently plugged with grafting or paraffin wax. The worker insects acquire a toxic dose of the poison when feeding and the bulk of the colony, sometimes the whole colony, is wiped out. Treatment is practicable on plants with a stem diameter of 2 inches or more, on which an auger can be used, the size of the auger depending of course on the dimensions of the tree.

In young trees, the soil should be removed from the base of the plant to a depth of two or three inches. After destroying the runways by hand, a little Paris-green is blown in the vicinity so that any runway linkages with the parent nest are impregnated. The base of the plant should be left open to the air to facilitate natural callousing of the wounds and to minimise the risk of contamination with disease organisms.

With herbaceous plants, Paris-green cannot be used effectively and fumigation may be practised. For this purpose, paradichlorobenzene is the most suitable soil fumigant, crystals being placed in $\frac{1}{8}$ oz. doses at depths of 4 inches in the soil, dosages being at least 1 foot from the plant and 18 inches from each other. Plants are liable to injury if excessive dosages are applied and the spacing must therefore be varied with the susceptibility of the plants requiring protection.

These methods of coping with white ants in orchards presuppose care and thoroughness, but, judiciously used, they help considerably in safeguarding valuable crops to which a great deal of time and attention have been given.

—*J. Harold Smith.*

CHECKING SOIL WASHING ON HILLSIDE BANANA LAND.

Cavendish and Mons Marie varieties of bananas are usually grown on hillsides and mostly in soils of a free, fine, shaley nature, which tend to wash very freely. Much of this soil can be saved by placing logs at intervals athwart the slope. On most clearings many logs remain unburnt and can be put to good use in this way.

All the straight lengths of timber up to, say, 8 inches in diameter will be found very useful in checking the downhill rust of water during heavy rains.

After they have been levered or rolled across the hillsides they should be "anchored" in position against stumps or by stakes and, possibly, large stones. It is not always possible to place them directly across the slope, because of the unevenness of the land, but they will prevent loss of surface soil, even if placed somewhat at an angle.

Where the land is carrying large "floaters," the stones also can be used to advantage by placing them in half circles below the banana stools and filling in the intervening hollow with soil.

When the plantation is in its second year and stripping of the lower leaves or desuckering is done, the material also can be placed with advantage along the logs to aid in preventing erosion.

—*E. F. Duffy.*

WIND BREAKS FOR BANANAS.

During the recent cold snap, the desirability of retaining suitable wind breaks around banana plantations has been indicated by the number of plantations which have been frosted.

As growers are now falling scrub to plant fresh areas, the necessity of retaining a belt of scrub about 2 chains wide around new areas cannot be too strongly stressed. Where the ground is definitely liable to frosting, it is a good plan to make the track through the scrub or forest into the plantation on a zigzag formation. In areas not liable to frosting, a wind break will greatly assist in keeping out cold winds which chill the plants and thus retard their growth.

Where plantations are already established, growers should give attention to the planting of wind breaks, of which two types are easily made. Lady's Finger or Sugar bananas planted in close formation round the plantation will produce a thicket, and so afford protection. Several border rows of Jarva cane will also give some protection against frost and wind.

Growers should remember that too much hard work is put into falling scrub, burning off, logging up, and planting areas to excuse the neglect of reasonable precautions against the possible damage to bananas from frost or cold winds, for one severe frosting followed by a warm day will render their plantations worthless.

—*W. E. Hamley.*

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

DISTINCT signs are now showing that the market for fruit is emerging from the depressed period experienced during the last few weeks. The unusual cold dull weather has been the depressing factor, and with a return of warm sunny days the consumption of fruit should rise considerably, relieving the market of its over-supplies of various fruits.

Another factor which is not given sufficient consideration is the actual distribution of fruit to the public. Dr. Ross, of America, who recently paid a visit to Southern Queensland, was scathing in his criticism of the lack of fruit supplied on the tables of the hotels where he stayed during his visit, which extended as far north as Bundaberg. Pointing out that we had the best fruits in the world at our disposal, he remarked that at most hotels fruit could only be had by the visitor as an extra or not at all. When travelling one can appreciate the truth of his observations. When it is realised that the months from May to October are the period when Queensland's tourist traffic is at its peak, one wonders whether a golden opportunity is not being missed for creating an outlet for the disposal of that extra portion of fruit over market requirements which is at present creating an over-supply, with consequent low prices. An organised "fruit on the table" campaign throughout the hotels and boarding-houses should bring beneficial results.

The damp weather has had a detrimental effect on the keeping qualities of citrus, and growers are urged to use every care in handling their citrus fruits in order to avoid skin damage.

Complaints are still being received about green papaws being sent to Southern markets. Growers must realise that this trade is only being developed, and that it is necessary for only good types of fruit to be sent South. For example, close examination of the types of papaws obtained from different trees will enable a grower to select the best. Further, a careful selection of only good types for seed when planting should assist a grower to eventually evolve a satisfactory type of fruit for long-distance transport.

Winter tomato growing locally has proved much more difficult this season than during the dry winter of last year. This has reduced supplies, enabling firmer rates to be maintained.

Avocados have sold well throughout the season, which is now drawing to a close.

Custard apples have remained firm since the early season period of over-supply. This fruit has never before been seen to greater perfection, the quality and packing being excellent.

Pineapples have been in good supply, and at times hard to move.

Because of the wet weather good-quality strawberries were hard to get at the start of the season, but supplies now are of excellent quality.

Market prices for the various fruits at the end of July were:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Nines, 16s.; eights, 9s. to 16s.; sevens, 9s. to 15s.; sixes, 4s. to 11s. 3d.

Sydney.—Cavendish: Nines and eights, 14s. to 16s.; sevens, 11s. to 14s.; sixes, 10s. to 12s.

Melbourne.—Cavendish: Nines and eights, 13s. to 16s.; sevens, 10s. to 14s.; sixes, 9s. to 11s.

Well filled Queensland fruit in demand.

Lady's Finger, 1½d. to 7½d. per dozen.

Pineapples.

Brisbane.—Smoothleaf: 4s. to 5s. 6d. case; loose, 1s. to 5s. per dozen. Ripley: 3s. 6d. to 4s. 6d. case; 6d. to 3s. per dozen.

Sydney.—7s. to 9s. per tropical case.

Melbourne.—8s. to 10s. per case.

Papaws.

Brisbane.—Yarwun, 3s. to 7s. tropical case; Gunalda, 3s. to 5s. bushel; Locals, 2s. to 3s. 6d.

Melbourne.—10s. to 16s. tropical case.

Green fruit unsaleable.

Custard Apples.

Brisbane.—2s. 6d. to 4s. half bushel.

Avocados.

Brisbane.—10s. to 12s. half bushel.

Granadillas.

7s. to 10s. per dozen.

CITRUS FRUITS.

Oranges.

Brisbane.—Navels, 6s. to 8s. per case; Commons, 4s. to 6s.

Small counts unsaleable.

Mandarins.

Brisbane.—Emperor, 5s. to 8s. case; small sizes, 3s. to 4s.; Scarlets, 4s. to 10s. case; Glens, 8s. to 12s.

Small sizes hard to dispose of.

Grape Fruit.

Brisbane.—4s. to 5s. per bushel case; Gayndah, 8s. to 12s. per bushel case.

Lemons.

Brisbane.—Gayndah, 6s. to 9s. per bushel case; Locals, 4s. to 6s. per bushel case.

Inferior grades lower and hard of sale.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, Victorian, 6s. to 9s.; Granny Smith, Imported, 8s. to 11s.; Stanthorpe, 10s. to 12s.; Delicious, 9s. to 11s.; Cleopatra, 7s. to 8s.; Scarlets, 5s. to 7s.; Sturmer, 5s. to 6s. 6d.; French Crab, 6s. to 7s.

Pears.

Brisbane.—Tasmanian and Victorian Winter Cole, 10s. to 14s.; Winter Nelis, 6s. to 11s.; Josephine, 7s. to 13s.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 2s. to 6s. half bushel; green, 3s. to 5s.; choice coloured, 6s. to 7s.

Melbourne.—Green, 5s. to 6s.; coloured and firm, 6s. to 8s.

Strawberries.

4s. 6d. to 7s. per dozen; choice packs, 8s. to 11s. per dozen.

Passion Fruit.

Brisbane.—First grade, 8s. to 9s.; seconds, 6s. to 7s.

Cape Gooseberries.

5d. per lb.

MISCELLANEOUS VEGETABLES, &c.

Cucumbers.

Brisbane.—Bowen cucumbers, 8s. to 10s. per case.

Melbourne.—9s. to 11s.

Pumpkins.—5s. to 7s. per bag.

Marrows.—2s. 6d. to 6s. per dozen.

Lettuce.—6d. to 2s. per dozen.

Cabbages.—2s. to 6s. per dozen.

Beans.

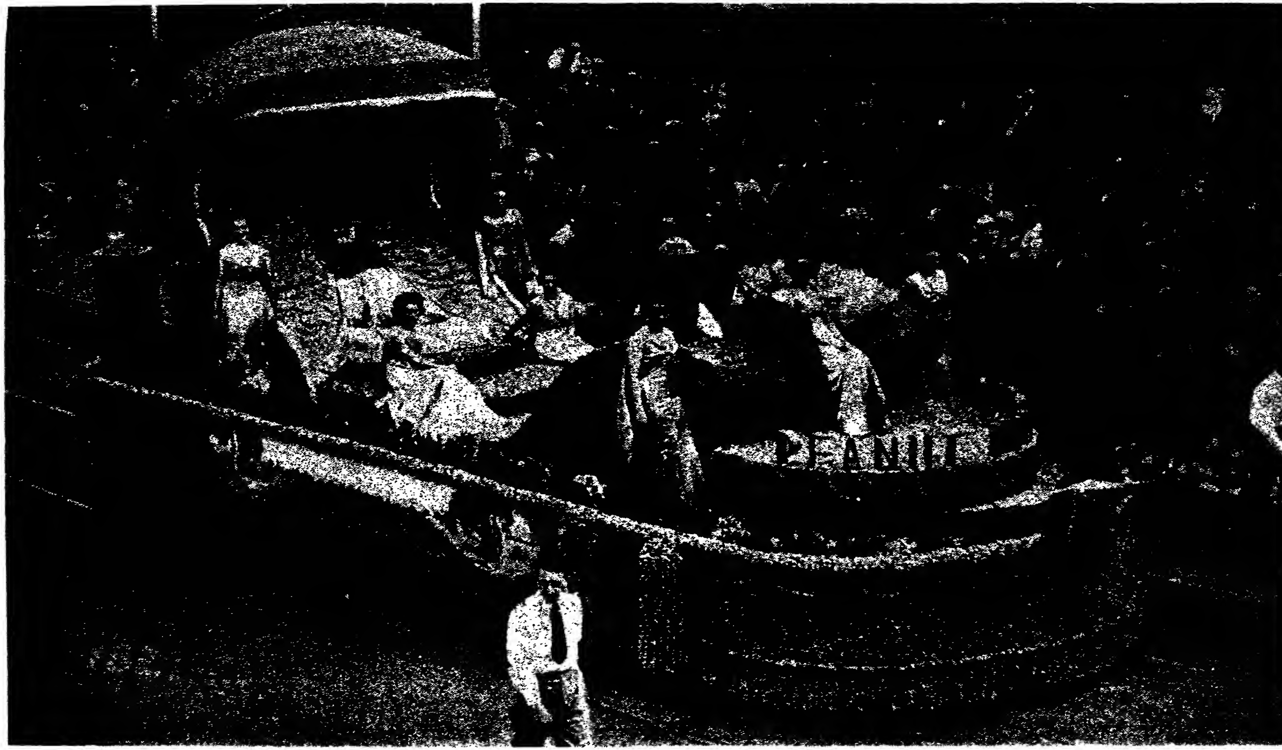
Brisbane.—10s. to 13s. sugar bag.

Melbourne.—4d. to 8d. per lb.

Peas.—5s. to 7s. sugar bag.

Chokos.—6d. to 1s. 3d.

Cauliflowers.—2s. to 8s. per dozen.



[Photo. by Hall and Co., Hunter street, Sydney, and supplied by courtesy of the Queensland Peanut Board.

Plate 75.

This strikingly beautiful float, one of the most colourful and outstanding features of the Sydney Sesquicentenary Pageant, was representative of every phase of the peanut industry. It also served to typify the spirit of Australian youth, as represented by the galaxy of charming young womanhood.

Peanuts used in the display were supplied largely from Kingaroy, Queensland's chief peanut-growing centre.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Ayrshire Cattle Society, production charts for which were compiled during the month of June, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE (STANDARD 350 LB.)			
Sunnyview Ruby	N. Bidstrup, Warra	11,795·23	404·064	Lovely's Commodore of Burradale
Rhodesview Primrose	W. Gierke & Son, Helidon	10,138·5	368·015	Blacklands Prospector
	SENIOR, 4 YEARS (STANDARD 330 LB.)			
College Doreen	Queensland Agricultural High School and College, Lawes	9,131·31	343·497	Premier 2nd of Hillview
	SENIOR, 3 YEARS (STANDARD 290 LB.)			
College Buttercup 3rd	Queensland Agricultural High School and College, Lawes	9,573·55	389·783	College Robin
	JUNIOR, 3 YEARS (STANDARD 270 LB.)			
Trevor Hill Polly	Geo. Gwynne, Umbiram	8,488·76	358·982	North Glen Emblem
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Trevor Hill Nectar	G. Gwynne, Umbiram	8,413·33	334·479	North Glen Emblem
	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
Chelmer Blossom	E. O. Jeynes, Raceview	11,064·67	430·316	Mountain Home Renown
Trevor Hill Aster	G. Gwynne, Umbiram	8,613·53	373·517	North Glen Emblem
Trevor Hill Fussy	G. Gwynne, Umbiram	7,634·43	308·083	North Glen Emblem
Ehlma Park Millie	N. Bidstrup, Warra	7,069·86	290·66	Mount Blow Monarch
Trevor Hill Crystal	G. Gwynne, Umbiram	8,185·5	289·066	North Glen Emblem
College Buttercup 5th	Queensland Agricultural High School and College, Lawes	6,590·49	285·562	Trevlac General
Jamberoo Modesty III.	N. Bidstrup, Warra	6,779·46	270·944	Brooklyn Terrace Banker
Ehlma Park Podge (256 days)	N. Bidstrup, Warra	6,992·39	251·18	Mount Blow Monarch
College Buttercup 6th	Queensland Agricultural High School and College, Lawes	5,782·91	240·959	Trevlac General

JERSEY.				
MATURE COW (STANDARD 350 LB.)				
Majesty's Belle of Brooklands	N. Webb, Beaudesert	11,753·4	587·826	His Majesty of Dalebank
Glenview Mavourneen	G. Harley, Childers	7,343·41	384·92	His Majesty of Dalebank
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Glenview Hawthorn	F. P. Fowler & Son, Glenview, Coalstoun Lakes	8,682·2	461·196	Trinity Governor's Hope
Glenview Hopeful	F. P. Fowler & Son, Glenview, Coalstoun Lakes	8,231·4	437·307	Trinity Governor's Hope
Carnation Princess Marina	W. Spresser & Son, Redbank	4,769·08	294·507	Vinchelez Golden Victory
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Hillsdale Centenary	F. W. Hohmann, Gowrie Junction	8,227·25	368·367	Pussey's Chief of Wyreene
Hillsdale Melba	F. W. Hohmann, Gowrie Junction	5,920·7	306·333	K. C. of Rosedale
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Calton Morel	E. Burton & Sons, Wanora	7,973·11	422·995	Larwood of Calton
Glenview Sultane's Jubilee	F. P. Fowler & Son, Glenview, Coalstoun Lakes	7,418·7	370·431	Trinity Governor's Hope
College Starbright 4th	Queensland Agricultural High School and College, Lawes	7,191·1	339·947	Belgonia Peggy 9th's Duke
Kathleen of Hillsdale	F. W. Hohmann, Hillsdale, Gowrie Junction	6,327·05	333·927	Pussy's Chief of Wyreene
College Pearl 2nd	Queensland Agricultural High School and College, Lawes	6,500·93	326·074	Belgonia Peggy 9th's Duke
Glenview Meadowsweet	F. P. Fowler & Sons, Glenview, Coalstoun Lakes	6,039·00	316·594	Trinity Governor's Hope
Jubilee Gift of Woodbine	G. W. Champney, Wooroolin	4,844·75	310·197	Brookland Royal Gift
College Florette 4th	Queensland Agricultural High School and College, Lawes	5,640·22	268·153	Belgonia's Peggy 9th's Duke
Hillsdale Jose	F. W. Hohmann, Gowrie Junction	5,289·95	250·479	Pussy's Chief of Wyreene
AYRSHIRE.				
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Aucher Eden Beauty	J. N. Scott, Camp Mountain	6,243·22	322·671	Fairhill Cameron

The Tropics and Man

The Health that is in Us.

DOUGLAS H. K. LEE, Profesor of Physiology.

Security versus Accomplishment.

"*One crowded hour of glorious life is worth an age without a name.*"

—*Scott.*

THIS quotation is familiar enough, but the problem behind it is far more than a personal one. To maintain security or to risk existence in an attempt at achievement has been a matter of tremendous moment throughout the realm of Nature since the world began, but more especially so since life began. What a noble example of solidity is a rock; with what massive calm it faces the buffets of nature—but what does it achieve? Many daring philosophers have described the logical consequences of an evolution along different lines from that now in progress, but none, as far as I know, has dared to suppose any effectual evolution with non-living matter as its main stream. As complex and progressive a world as that about us could never have eventuated but for the origin of living matter. In that one act Nature relinquished stability and security for the chance of accomplishment. The whole course of evolution since that time has been marked—nay, directed—by a fight to maintain security and flexibility in the best proportions for the situation then existing. When the proper balance has not been obtained, or when the situation has changed, the species has been doomed, and some better-adapted form has taken the lead. For size and thickness of hide nothing could rival those monster reptiles, Brontosaurus and his playmates; but this security proved their undoing. They soon got to the size when mobility became impossible. If you increase an animal's size ten times you increase his weight 1,000 times, and to support this his bones would have to be, not ten times as thick, but more than thirty times as thick. The situation eventually became absurd, and, to use a popular phrase, the small, fleet animals could "put it all over" these lumbering giants.

Man, the Masterpiece of Compromise.

After æons of trial and error, Nature has produced her masterpiece of compromise—Man. Throughout the general animal kingdom Nature has relied upon nine methods of defence—concealment, camouflage, association with stronger animals, natural weapons, inedibility, armour, flight, cunning, adaptation. Man, the king of all, has practically abandoned most of these, the more passive methods of protection, as they literally "cramped his style." It is upon the last two—cunning and adaptation—that he depends for security.

Man's enemies, however, are not all animals like himself. There are many other forces working for his destruction—bacteria, poisons, temperature changes, and the host of those resulting from his own ingenuity—ships that sink, motor cars that crash, aeroplanes that fail. These call for very much more resource than the relatively simple manoeuvres of a beast of prey.

Let us examine some of the extremely delicate mechanisms that make up this masterpiece in action.

Protection against Infection.

Here is an army of septic bacteria, Staphylococcus by name. They are leading a harmless, peaceful existence for the moment on a dirty piece of linen. A child decides—for a reason known only to children and psychologists—that this dirty piece of linen is a favoured toy, and bestows its affection upon it. The "Staphs," to speak familiarly, are transferred to the child's skin. This is much more to their liking; so they wax fat and multiply. The healthy skin, however, although no longer of armour-plate quality, still retains its biological protective power. Although it allowed the "Staphs" to live comfortably, it entirely prevents their passage into the body. But suppose the skin is not healthy, suppose the hair roots have been irritated by the accumulation of sweat and grease, unremoved by adequate washing. What happens? The barrier is weak, the accumulated dirt is an excellent growing medium, the bacterial forces increase and penetrate the skin—the body's first line of defence. The hair roots become inflamed and the beginnings of a boil or a carbuncle are formed. If the body generally is healthy sufficient scavenging cells and anti-bodies are brought by the blood-stream to prevent any further spread of the trouble—a sort of chemical warfare is waged which, in the first place, stops the organisms from spreading and, in the end, exterminates those which have gained a local footing.

But again, suppose the body is not healthy. Suppose, for instance, the vitamin intake in the food has been only just sufficient for body needs. A demand is now made upon them and there are no reserves. The chemical troops are deprived of certain essential materials. Or suppose the body is already engaged upon another front—for example, the tonsils—and things are not going too well. In either case it is highly probable that the local resistance will be too weak to prevent the "Staphs" from spreading. A large boil or a nasty carbuncle is the least that can result. In such a case the body's reserves will be mobilised upon a much larger scale, and very probably win the day. In a war, however, there are no victors. Although the body may win the local battle, its reserves are depleted, its efficiency reduced—as you very well know if you have ever had a carbuncle. For some time afterwards the body is more open to a successful attack by one of its many enemies—it is in a run-down condition, to use every-day language. But this is only the least of the possible trouble. The invading "Staphs" may meet with practically no resistance and break into the blood-stream. Now the life of the whole body is in danger. There is no limit to the spread of the infection—it can go to all parts of the body and set up abscesses everywhere. Some of these may be in vital organs, such as the brain, but apart from this you cannot expect the body to stand up to poisons produced in mass all over the body. Blood-poisoning, even by these mildly toxic organisms, is very often fatal.

Thus we have a chain of events—soiled linen, irritated skin, poor chemical defence, invasion of blood stream, widespread abscesses, death—all because of what? You will say, "Soiled linen." Logically, you will be right, but practically I should prefer to say, "Lowered resistance." While one should keep dirty articles away from children,

it is an impossible task, and Staphylocci are always with us. It is much more efficient and much more practicable to maintain the resistance of the body at, not a high level, but the *highest* level. Use the powers the body possesses to their utmost. This can be done only by attending to all the many items which go to make up health—cleanliness, exercise, balanced meals, avoidance of excesses.

Protection against Overwork.

Now let us turn our attention to a different case. Here we have a man doing heavy work. We know very well that if he works too long he will get fatigued, perhaps so fatigued that he will be fit for little next day; or if he tries to do too much at once he will "strain himself." What stops the average man from exceeding either of these limits—beyond, perhaps, a natural disinclination to do too much? Or, on the other hand, if there is a natural check, why do we sometimes overstep it and suffer the consequences? Again, what part does training play?

The answer to some of these questions comes when you examine a muscle at work. It consists of a number of elastic fibres side by side, and fixed at one end, which, when told to do so by their nerve, contract. If the weight they are asked to lift is too heavy they simply cannot contract, or, if the stimulus is very great, may actually tear themselves off their attachments. The more practice they get at lifting, the larger and stronger they become, and the firmer become their attachments. This is *one* reason why training is so important. Generally speaking, the brain quickly becomes aware of the fact when too great a strain is being put on the muscles and the attempt is abandoned, but the warning messages from the muscles are sometimes ignored in the excitement of the moment—hence the "tennis elbow." Sometimes, of course, the opposite is the case; the brain decides the job is impossible although the muscles are quite capable of carrying it out—this is labelled "lead-swinging."

For continuous work, the muscles must have a good blood supply, and a good blood supply means a good heart, capable of great increases in work, and good blood-vessels. Work in cramped positions, or work beyond the point at which the heart and blood vessels can keep up a proper supply, leads to the accumulation of waste products in the muscles. These stimulate nerve endings in the muscle and give rise to that familiar sensation of muscle pain or fatigue. This warning bell is rung before the muscles get into a dangerous condition, and it is a warning very difficult to ignore.

So again in muscular work you see body safeguards at work, but a different system of safeguards—a warning system informing the brain, which is the directing influence in work. This system is generally an efficient one, but may be overcome if the muscles are weakened by disease or malnourishment, if strenuous exercise is forced upon muscles which have not been adapted to it by intelligent training, or if sudden strains are thrown upon muscles unprepared or ill-adapted for the purpose. Even an inherently "fool-proof" system like the muscles may be beaten by the exercise of unintelligent will-power.

To some, perhaps, the term "overwork" calls to mind the guttering candle, the wet towel on the brow, and the clock ticking remorselessly on to the examination hour. Here again the body has its automatic protective devices. When you find yourself coming to the bottom of

the page for the third time, without the remotest idea of what is on it, then, most certainly, have you reached the limit. You may be able to drive yourself still further under the stress of emotion, but only with danger and certainly without efficiency. The mechanism which deals with judgment is being thrown out of circuit, as you would switch an overheated iron out of circuit; to put it in again is to court disaster. There is only one thing to do—go to bed and let the overheated iron cool off.

The Chink in the Armour.

This brings us to the crucial point of this talk. That extraordinary organ—man's brain—developed through geological ages from the undifferentiated nerve-net of the lowly Cœlenterate, is at once man's proud heritage and his betrayer. As I mentioned before, a great deal has been sacrificed in the course of evolution to the brain, and a great deal of power has been given to it. While automatic machanisms exist it is necessary that the brain should be able, if the necessity arises, to override them and determine the issue to the advantage of the body as a whole, as distinct from the immediate interest of the part in question. An automatic mechanism provides that you should pull your hand away when a bee stings you, but I wonder what your brain would decide to do if the said hand were supporting you from a branch hanging over a precipice. The brain was intended to be the benevolent dictator, for whom most of us have at times longed—provided the Dictator had our ideas, of course. The idea is a good one—as long as the Dictator is sufficiently informed, infallible, and strictly benevolent. Alas for Man, no one of these things is perpetually true! For one reason or another—an emotional interlude, a set belief, an uncritical judgment, or perhaps the mere strength of a trained automatic response—the brain often fails to discharge the duties for which it was designed, and the good of the whole body fails.

Some of these mistakes are beyond control, but many—far too many—are avoidable. We deliberately ignore the warning Nature has developed for us, think it is unmanly to take care, feel it is the thing to "crack hardy." No doubt many of these ideas had very good foundation under the circumstances of their creation, but they have long since been lifted into the realm of logic-defying creeds. We have the creed of the muscles, the creed of records, the creed of sun-tan, the creed of no-breakfast, and the creed of slimness—each containing a certain germ of truth, but practised to an extent that is usually ludicrous, often positively harmful. No one who has the slightest knowledge of the body's working or appreciation of its delicate mechanism could advocate starvation diets or herculean tasks as a regimen for any except a very few for very special reasons. But these are understandable human foibles. It is a matter for much greater concern that there should be abroad so much ignorance and apathy about health. Governments can legislate, and advisers pour out their wisdom, but it counts for very little if the people are not interested. What greater tragedy can there be than to have the most wonderful and delicate machine ever fashioned ruined and despoiled, not by genuine though misdirected enthusiasm, not by legitimate though awkward experiment, but by sheer carelessness, ignorance, and apathy!

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Red Head or Milky Cotton Bush.

R.B. (Maleny)—

The specimen is *Asclepius curassavica*, red head or milky cotton bush, a native of tropical America, but now naturalised in most tropical and sub-tropical countries. It is a very common weed in Queensland and New South Wales. It is poisonous, producing gastro-enteritis in stock. It is very distasteful to them, and so is not generally eaten in sufficient quantities to cause death. In spite of the fact that the plant contains a very poisonous principle, feeding tests with it are rather conflicting. Most of the trouble that has been reported to us has been with poddy calves or young stock.

Oriental Mustard. Pepper Cress.

V.L.L. (Brigalow)—

The larger specimen is *Sisymbrium orientale*, the oriental mustard. This is a native of Europe, and is now a common weed in most temperate countries. It is fairly common as a farm weed in Queensland, but is not known to possess any poisonous or harmful properties. Like other members of the turnip family, it taints the milk of cows. "Mustard Weed" is the common name generally applied to it, although this local name is also given to other weeds of the same family.

The smaller plant is *Lepidium ruderale*, the pepper cress, a plant very widely spread over the temperate regions of the world. It is very common in Queensland as a weed both of cultivation and of the pasture. It is quite good fodder, but taints milk and cream badly. It is in fact, one of the worst offenders in this respect. It belongs to the same genus *Lepidium*, as the cultivated garden cress. Water cress belongs to an allied genus.

Both plants you send are members of the family *Cruciferae*, which contains the turnip, radish, cabbage, and many other cultivated plants.

A Useful Grass.

U.B.W. (Yandina)—

The grass is *Eulalia argentea*, a fairly common grass in some parts of coastal Queensland, particularly along the North Coast line between Landsborough and Gympie. We have not heard a common name applied to it, and do not think, usually speaking, it is regarded as a very good forage. It has a value, however, in that it grows on second class country inclined to be swampy where other grasses will not thrive.

Coast Button Grass.

M.C. (Mackay)—

The specimen is coast button grass, *Dactyloctenium aegyptium*, a native grass fairly common in coastal Queensland from Rockhampton northwards. It is generally regarded as quite a good forage and frequently grows in sandy land almost on to the sea beach. It is an annual, but may last more than a year. During the summer it is at its best, and generally speaking, tends to die off about May or June, though sometimes may last, green, into July or August according to the season.

Wild Sage.

A.M.R. (Toowoomba)—

The specimen is wild sage *Salvia verbenaca*, a common English and European plant now naturalised in most temperate countries. In Queensland it is confined more or less to the Darling Downs. So far as we have observed, it is not a particularly aggressive weed here. Although sometimes fairly abundant, and calls for no special method of eradication. It is sometimes called "Cleary" (Clear Eye) in England and was used by herbalists for eye complaints. The seeds, when placed in water, yield a mucilage which, when placed in the eyelid for a few minutes, envelops any particle of dust which may be causing trouble in the eye. The plant is not known to possess any poisonous or harmful properties.

General Notes

Staff Changes and Appointments.

The appointment of Mr. R. Letters as an inspector under the Diseases in Plants Acts, Brisbane, has been confirmed as from the 1st December, 1937.

Mr. C. L. Mudd, Inspector of Stock, Dairying and Slaughterhouses, Brisbane, has been transferred to Killarney.

Sergeant A. T. Hogan, of Boonah, and Constable R. L. Gannon, of Kajabbi, have been appointed also inspectors of slaughterhouses.

Mr. John Richters (Durong, via Tingoora), Mr. C. A. Cocks (Burke street, Ayr), and Mr. E. H. Hewett (Burke street, Ayr) have been appointed honorary protectors under the Fauna Protection Act.

Mr. A. F. Crees has been appointed an inspector of stock, dairies, and slaughterhouses.

The following members of the Police Force have been appointed also inspectors of slaughterhouses: Sergeant 2/C J. H. Cooke (Home Hill), Constable N. F. Gee, (Coomera), Constable I. L. Eggins (Tewantin), Constable H. W. Ambrose (Peranga), Constable W. C. J. Powell (Stonehenge), Constable G. W. Mouatt (Oaks), and Constable W. E. Hogbin (Ewan).

The following members of the Pioneer Mill Suppliers' Committee, Ayr, have been appointed honorary protectors under the Fauna Protection Act: Messrs. L. W. J. Hoey, J. H. Hawkins, M. T. Norris, P. Sayers, and L. F. Laun.

Mr. E. B. Rice, dairy technologist, has been transferred from Brisbane to Toowoomba.

The appointment of Miss M. A. Lyle as assistant cane tester at Inkerman Sugar Mill has been cancelled, and Miss Lyle has been appointed to the position of cane tester at the Invicta Mill, in place of Mr. L. C. Home, resigned.

The appointments of Messrs. G. R. Kronk, E. J. Delaney and V. W. Keating as assistant cane testers have been cancelled, and the following have been appointed Assistant Cane Testers for the current season:—Messrs. B. McMaugh and S. Wilson at the Maryborough and Marian Mills, and Misses K. M. O'Brien and W. Page at the Fairymead and Inkerman Mills, respectively.

Constable J. Bennett (Marburg) and Constable J. H. Lewis (Mungallala) have been appointed also slaughtering inspectors.

Mr. H. D. Grimes, inspector, Diseases in Plants Acts, Stanthorpe, has been appointed agent under the Banana Industry Protection Acts and inspector under the Diseases in Plants Acts, and attached to Nambour.

Mr. J. Byron, temporary grader, Cotton Section, has been appointed grader, Cotton Section, Department of Agriculture and Stock.

Mr. T. W. Murray, head teacher, State School, Elliott, has been appointed inspector under the Diseases in Stock Acts, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock.

Mr. L. G. Walker, Inspector of Stock, Slaughtering, and Dairies, has been transferred from Cunnamulla to Brisbane.

Mr. E. J. Taylor, Stock, Slaughtering, and Dairy Inspector, has been transferred from Brisbane to Toowoomba.

Mr. E. B. Rice, Dairy Technologist, Department of Agriculture and Stock, Toowoomba, has been appointed also an inspecter under the Dairy Produce Acts.

Constables N. R. J. Carolan (Birdsville) and A. W. Dargusch (Mungana) have been appointed also inspectors under the Slaughtering Act.

The following members of the Wangaratta Shire Council, Bowen, have been appointed honorary protectors under the Fauna Protection Act:—

Messrs. A. H. W. Cunningham, Strathmore, via Collinsville; A. Pott, Burnfoot, Bowen; J. Maltby, Firsby Farm, Bowen; G. Pott, Newstead Farm, Bowen; A. E. Beak, Salisbury Plains, Willmington; V. A. Toms, Moss Vale, Bowen; F. S. Isbell, Havilah, Collinsville; P. N. Lumsden, Mount Coolon; W. G. Preston, Mount Coolon; H. T. Bridson, Chesterfield, via Clermont; R. M. Henderson, Collinsville; R. J. Bowes, Collinsville; and D. S. Malcolm, Collinsville.

Mr. G. Chinn, Kairi, has been appointed also an honorary protector under the Fauna Protection Act.

The following transfers of District Inspectors of Stock have been approved:—

Mr. F. R. Dunn, District Inspector of Stock, Cloncurry, has been transferred to the position of District Inspector of Stock, Brisbane.

Mr. W. Dixon, at present Inspector of Stock, Goondiwindi, and recently appointed a District Inspector of Stock, will be attached to Cloncurry.

Mr. D. Hardy, District Inspector of Stock, Emerald, has been transferred to the position of District Inspector of Stock, Rockhampton.

Mr. P. P. Comiskey, at present Inspector of Stock, Boonah, and recently appointed a District Inspector of Stock, will be attached to Emerald.

The following transfers of Inspectors of Stock have been approved:—

Name.	From	To
Mr. T. Douglas	Rockhampton	Goondiwindi
Mr. J. W. Mackay	Wowan	Rockhampton
Mr. R. J. O'Sullivan	Killarney	Wowan
Mr. S. J. Monaghan	Brisbane	Boonah
Mr. S. C. C. Jessop	Toowoomba	Brisbane
Mr. W. R. Burnett	Brisbane	Toowoomba
Mr. N. C. Copeman	Wandoan	Crow's Nest
Mr. S. M. Seamer	Julia Creek	Wandoan

Fauna Sanctuary at Durong.

An Order in Council has been issued under the Fauna Protection Act declaring the property of Mr. C. Park-Smith, at Durong, via Tingoora, to be a sanctuary under the Act. The property is described as portion 100, parish of Burraburri, County of Auburn, with an area of 1,125 acres 1 rood.

Local Sugar Cane Prices Boards.

The Regulations under the Regulation of Sugar Cane Prices Acts provide that Local Sugar Cane Prices Boards shall meet not later than fourteen days after the appointment of members of such Boards. An amendment issued to-day deletes the provision that Local Boards shall meet within such period of fourteen days.

Removal of Dead Wood from Orchards.

A Regulation has been issued under the Diseases in Plants Acts which provides that an occupier or owner of an orchard shall destroy, by burning, dead fruit trees or prunings which are liable to disseminate disease.

Cane Pests Boards—Voting Powers.

Regulation 47 under the Sugar Experiment Stations Acts, which provides that no member of a cane pests board shall vote in respect of any matter in which he has, directly or indirectly, any pecuniary interest, has been amended.

The amendment makes provision that a member of a cane pests board shall not be debarred from voting on any matter affecting the purchase of pest control materials or the subsidising of fumigant purchases, or, with the prior approval of the Minister, on the matter of remuneration to be paid for attendance at meetings.

Stallion Board Appointments.

East Moreton.—J. C. J. Maunder, B.V.Sc. (Chairman), D. Jackson, and R. J. F. O'Bryen.

West Moreton.—A. F. S. Ohman, M.V.Sc. (Chairman), D. Jackson, and R. J. F. O'Bryen.

Central Coast.—M. R. Irving, B.V.Sc. (Chairman), G. Elliot, and J. H. Wall.

Northern Coast.—M. H Irving, B.V.Sc (Chairman), W. C. Jeffery, and H. S. Handley.

Northern.—A. L. Clay, B.V.Sc. (Chairman), T. Turkington, and W. Frood.

Important Point for Motorists.

Users of closed cars are reminded of the danger of driving for any length of time with all the windows closed.

Cars are prolific generators of the deadly carbon-monoxide gas, which is tasteless, odourless, and colourless, and can cause death very quickly when inhaled in any closed space. It is produced in the combustion chamber of the engine, and is carried off by way of the exhaust, but where there is a leak in the exhaust pipe or the muffler, the gas is likely to enter the interior of a car—more especially the older models—through cracks in the floorboards.

Any driver suffering headaches while at the wheel of a closed car should suspect the presence of carbon-monoxide and ensure immediately an ample supply of fresh air.

Banana Levy.

An Order in Council has been issued under "*The Banana Industry Protection Acts*, 1929 *to* 1937," providing for a levy on banana growers to be used for the maintenance of the Banana Industry Protection Board.

The levy is at the rate of 1½d. per one and a-half bushel case of bananas, and 2d. in the £ sterling on bananas marketed in the bunch. The levy is the same as that which has been operating for some years past.

Pineapple Levy.

Executive Council approval has been given to the extension of the Pineapple Levy Regulation for a further period of twelve months from 28th August. This levy is made under the Fruit Marketing Organisation Acts and is administered by the Committee of Direction of Fruit Marketing.

Imperial Fruit Show.

The Department of Commerce has received class schedules and entry forms for the Imperial Fruit Show and Canners' Exhibition, which this year is to be held at Bristol, England, from 28th October to 5th November.

The Australian products which may be entered for competition include honey, citrus fruits, apples, canned produce, and fruit juices.

The pure fruit beverages section which was added to the Show last year is being continued, and the citrus and grape juice classes are open to competition for Australian exhibitors.

Last year there were seventy entries from Australia, which constituted a record for this country, and considerable success attended many of the entrants.

It is hoped that the Imperial Fruit Show will be supported equally well this year by Australian firms, for it provides an excellent opportunity to demonstrate the high quality of the Australian product in competition with that of other Empire countries.

Entry forms and full particulars are obtainable from the Department of Commerce, Commonwealth Offices, Brisbane, and entry forms must be lodged with that Department not later than 22nd August, 1938.

Game Restrictions.

An Order in Council has been issued under "*The Fauna Protection Act of* 1937" prescribing the following as the maximum numbers of birds which any one person may take or kill in any one day during an open season:—20 wild ducks, 25 quail, and 2 scrub turkeys.

Canary Seed Board.

The election of two growers' representatives on the Canary Seed Board resulted as follows:—

	Votes.
Ernest Ambrose Thomas, Roma	113
William Alexander Ross, Macalister	107
Garrett Denis O'Neill, Table Top, Allora	70

Messrs. Thomas and Ross will be appointed for a term of one year. Mr. Ross has displaced Mr. G. D. O'Neill, the present member of the Board.

Value of Sown Pastures.

The Editor of *The Farmer* (Maritzburg, Natal, South Africa) writing in appreciation of a series of articles in the *Queensland Agricultural Journal* by C. W. Winders, Assistant Research Officer, says:—"Sown pastures are growing in popularity in this country, and I feel that Mr. Winder's review of the various types would be most valuable to our readers. A well-known Natal farmer, Major P. F. Wall, estimates that unimproved veld worth, say, £5 per acre, can be raised in value to between £100-£200 by planting suitable grasses in favourable localities."

Citrus Levy.

The citrus levy regulation which came into force in April, 1936, and was extended last March, has been further extended for a period of twelve months from 1st March, 1938.

An amendment has been made in the regulation which provides that the minimum levy shall be 1d. a bushel case and ½d. a half-bushel case. At present, the minimum levy is 1d. a case.

Sugar Experiment Stations Advisory Board.

The Regulations under the Sugar Experiment Stations Acts relating to meetings of the Sugar Experiment Stations Advisory Board have been amended.

A new Regulation 20A provides that at any meeting of the Board the Secretary of the Queensland Cane Growers' Council may act as deputy for an absent growers' representative, and the Secretary of the Australian Sugar Producers' Association Ltd., may act as deputy for an absent manufacturers' representative.

A member of the Board who travels to or from a meeting other than by rail may be paid an amount not in excess of one first class rail fare in respect of each such journey.

If within fourteen days of the expiration of the term of office of the Board the sugar organisations entitled to nominate representatives of growers or manufacturers for appointment as members of the Board have failed to make any such nomination, the Minister is empowered to nominate sufficient representatives to complete the membership of the Board.

The Minister is given similar powers with regard to any vacancies on the Board which may occur during its term of office, where within fourteen days of the vacancy occurring the organisations entitled to nominate a successor have failed to do so.

Poultry Sales.

A new Regulation issued under the Diseases in Poultry Acts, provides that no agent shall be entitled to receive as commission, fees, charges, reward or other remuneration for or in respect of services or transactions carried out by him in respect to the sale of poultry, any amount in excess of 7½ per centum of the gross amount received for the sale of such poultry.

Wool Draft Allowance Abolition Act.

A Proclamation has been issued under "*The Wool Draft Allowance Abolition Act of* 1936" which will bring that measure into force in Queensland as from the 1st July, 1938.

Cattle Creek Mill Levy.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts empowering the Cattle Creek Mill Suppliers' Committee to make a further levy for administrative purposes at the rate of one penny three farthings per ton of sugar-cane supplied by growers to the Cattle Creek Sugar Mill.

Declaration of Swine Dysentery as a Disease under Diseases in Stock Acts.

An Order in Council has been issued to-day under the Diseases in Stock Acts declaring swine dysentery to be a disease under and for the purposes of such Acts.

Poultry Registration Amended.

An amendment of Regulations under the Diseases in Poultry Acts has been approved. This provides that the owner of introduced poultry or day-old chickens on arrival from another State shall deliver to an inspector at the place of introduction a declaration that such poultry or day-old chickens are free from pullorum or other diseases. The declaration shall be further endorsed by an inspector of the Department of Agriculture and Stock from which the poultry are being introduced to the effect that a test of such poultry for disease has given negative results.

Wild Life Preservation.

Orders in Council have been issued to-day under the Fauna Protection Act declaring Eurominda, Pelican—the property of Mr. H. K. Nevell—and Currawong and Gyranda Grazing Selections in the Taroom District—properties of Messrs. F. W. Horn, Ravenscraig, Camboon, and Joyce and Joyce, Eidsvold—to be sanctuaries for the protection of fauna. Messrs. F. W. Horn and R. F. Joyce have been appointed honorary protectors.

Southwick West, in the Charters Towers district, the property of Mrs. V. O. A. Allingham, Ingham, has been declared a sanctuary for the protection of wild life under "*The Fauna Protection Act of* 1937."

An Order in Council has been issued under "*The Fauna Protection Act of* 1937," declaring Settlement Pocket, Alice River, near Barcaldine, to be a sanctuary for the protection of fauna. Mr. J. E. McHugh, of Barcaldine, has been appointed an honorary protector in connection with such sanctuary.

"Mundoolun," Broomfleet, the property of Mr. D. M. Fraser, has been declared a sanctuary under "*The Fauna Protection Act of* 1937." Mr. Fraser has been appointed an honorary protector in respect of the sanctuary.

Mr. G. Shave, Barcaldine, has been appointed an honorary protector under the Fauna Protection Act.

Rural Topics

Crops for Winter and Spring Feed—A Correction.

In the June issue of this Journal, under the heading "Crops for Winter and Spring Feed," page 658, a departure from the original manuscript occurred, conveying the impression that field pea and vetch seeds should be ploughed in. The third paragraph should have read, "In the absence of seed drills, broadcasting is usually adopted, sowing the legume first, and discing or cultivating in, following with cereals which are broadcast and harrowed in." Similarly, the sixth paragraph should read, "Rape may be sown from March to May, drilling in 4-5 lb. of seed per acre."

The Current Cane Crushing.

An all-time record is in sight for the current cane harvest. The present estimate is 5,460,000 tons of cane. Making some allowance for a standover crop in some of the southern areas, it is probable that at least 5,200,000 tons will fall to the knife, and from that crop a yield of 750,000 tons of raw sugar is anticipated. Early crushings are returning a high sugar content and the millings will probably equal—if not surpass—the aggregates of the past two seasons. That means that the "excess" sugar problem will remain as acute as ever.

The reduction in the sugar export quota, although slight, indicates the necessity of continuing a tight control on Australian sugar production. In the circumstances, growers may have to turn their attention to other farming enterprises, either as alternatives to or in combination with cane-farming. Results of recent trials at Mackay point to fat lamb raising as, at least, one possible payable sideline.

A Policy for the Pig Industry.

The Australian Meat Board has investigated the position of the export trade of pig meats to the United Kingdom and now states that there is provision for a steady expansion of this trade.

In an endeavour to set a policy for the Australian pig industry the Board has, after thorough investigation, made recommendations—firstly to the effect that the baconer trade should be fostered rather than the porker trade; and secondly, that the carcase specifications as published by British authorities should be adopted by Australian producers.

Subject matter relevant to these recommendations has been published in booklet form by the Australian Meat Board, and copies are available free of charge from the Department of Agriculture and Stock, Brisbane.

Value of Eucalypts—The "National Tree" of Palestine.

When the Australian Light Horsemen were campaigning in Palestine during the great war, they realised to the full the meaning of nostalgia—the dictionary term for homesickness—as the smell of burning gum leaves scented the air while camped near groves of eucalypts which had been introduced from Australia.

Here is what Dr. B. Shein, a recent visitor to Brisbane, had to say of a valuable Australian native:—

"The Australian eucalyptus has become almost the national tree of Palestine, for it has almost rid the country of its former scourge of malaria."

Thanks to the eucalyptus, added Dr. Shein, who left Jerusalem in May, the young people of Palestine were growing up in perfect condition.

Dr. Shein is on a world lecturing tour to tell of the position of the Jewish people in all countries, particularly of those in Palestine. The Zionist organisation, he said, concentrated on the building up of Palestine. Since the war 400,000 Jews had settled in Palestine, and agricultural as well as industrial enterprise on a large scale had been developed. It was intended that as many Jews as the country could absorb should settle there and form a national home.

The Jewish people were thankful to Australia for what had been accomplished by the eucalyptus tree, which had been planted in great numbers in the last forty years. The trees, which absorbed much water, had together with a draining system, dried up much of the marsh lands which had caused an incidence of malaria in some villages of up to 80 per cent. of the population.

Butter in the Bible.

For butter it can be truly claimed that it possesses a tradition that goes back to the earliest period of civilisation. According to the Bible, Abraham took butter and milk and the calf which he had prepared and set them before his visitors. Butter formed a part of the greatest and holiest sacrifices of many of the ancient peoples. The Greeks and Romans used it as a remedy for injuries to the skin, and the soot of burned butter was regarded as a specific remedy for sore eyes. The maidens of old Alexandria annointed themselves with "milk oil," and it is recorded that in many cold regions people used butter in their baths. Until comparatively recent times butter was used as oil for lamps, and historians relate that, as late as the seventeenth century, the medicine shops of Spain labelled butter "for external use only."

Fined for Undercutting Butter Prices.

At Dublin (Eire) recently, two fines of £15 were imposed on a provision merchant for having sold butter at less than the price fixed by the Department of Agriculture.

Living Standard in England.

In Britain the general standard of living is high. It is estimated that 1⅗ acre is required to produce the diet enjoyed by the average Englishman. At the present standard Britain produces enough food to satisfy only 18,000,000 of the population. Every effort is therefore being made to increase the area of cultivated land.

Treatment of Cows with Sore Teats.

Wire cuts and wounds on cows' teats are among the disagreeable experiences of dairying. Milking irritates the wound and aften causes bleeding, besides being painful. In such cases, absorbent cotton wool placed over the wound so as to make a soft pad between the milker's hands and the teat will give relief and arrest bleeding. After milking, an antiseptic ointment should be applied.

Points in Calf Rearing.

For success in calf rearing it is essential to observe these rules:—

- Always handle calves quietly and patiently.
- Feed at regular intervals every day.
- Feed only on perfectly clean sweet milk.
- Feed with milk at body temperature (about 100 degrees, Fahrenheit.)
- Always cleanse feeding buckets as scrupulously as you would all other dairy utensils.
- Provide shade in summer and shelter from winter weather.

Effect of Tillage.

To grow crops, tillage is a necessity. What effect does tillage produce? Tillage loosens the soil temporarily and produces what is called a "good tilth." Continual tillage, however, packs the soil and diminishes water movement and aeration. Experience on farm and experiment station the world over demonstrates that the most feasible way of maintaining soil structure is by combining ordinary farming with grassland farming. This form of crop rotation should not be left until the farming land has been worked to the point of exhaustion. Queensland cotton growers, for instance, are finding cultivated crop and grass rotation a very profitable practice from every point of view.

The Quality of Australian Butter.

That Australian "Kangaroo" brand butter is, on the average, better than any butter going to the London market, including Danish, is the belief of the Commonwealth Supervisor of Dairy Exports (Mr. F. Wigan). He has expressed a doubt whether the butter of any other country has as high a keeping quality as Australian, which is also of high texture. This rise in the quality of Australian butter is attributed largely to the grading standards and the work of the graders. This quality can only be improved—or, at least maintained—by a continuance of complete co-operation between the farmers and the factory managers.

The Value of Refrigeration.

Professor Young of the Melbourne University, speaking of the influence of refrigeration on Australian economy said that the value of produce exported yearly under refrigeration from Australia and New Zealand is £75,000,000.

Orchard Notes

SEPTEMBER.

THE COASTAL DISTRICTS.

IN the North Coast and Gayndah districts the bulk of the citrus crops have been harvested with, perhaps, the exception of Valencia Lates. Orchard activities should be directed towards pruning, cultivation, fertilizing, and spraying. As a result of seasonal conditions some trees are showing signs of impaired vigor, and these will require a severe pruning both in thinning and shortening back, removing superfluous growths and diseased and weakly woods. Healthy and vigorous orange trees will require little attention beyond the removal of crowded lateral growths.

Mandarins will need special treatment, particularly Glen Retreats and Scarlets. These varieties usually produce a profusion of branches, and as the trees mature the growths harden and the fruit-bearing shoots make short, weakly growths, which generally result in an overproduction of small fruits and a weakening of the trees. This is particularly noticeable in the case of the former variety. Here the annual pruning should consist of a heavy thinning and shortening back. Mature mandarin trees require attention towards assisting them to produce new and vigorous fruit-bearing growths.

Unprofitable trees should receive attention and be prepared for top-working. They may be headed back to three or four main arms radiating from the stem and whitewashed to prevent bark scald. Such trees may be grafted or later budded when suitable growths have matured.

Prior to working up the soil, fertilizing should receive attention. The spring application should carry a high percentage of nitrogen.

In the warmer districts which are free from frosts plantings of young trees may be made. Serious consideration should be given to the selection of commercial varieties only, and, having due regard for local conditions, selections may be made from the following varieties:—Washington, Navel, Joppa, Siletta, Valencia Late, Beauty of Glen Retreat, Emperor, Scarlet, Solid Scarlet, Marsh Seedless or Thompson grapefruit, and Villa Franca, Lisbon, and Genoa lemons.

Where melanose and black spot are present in orchards preparations for control measures should be made, and Bordeaux sprays applied at the correct times.

The majority of citrus trees would be considerably benefited by the application of a strong lime-sulphur wash, 1-18.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

BLACK aphis should be fought wherever it makes its appearance by spraying with a tobacco wash, such as black-leaf forty, as if these very destructive insects are kept well in hand the young growth of flowers, leaves, wood, and fruit will have a chance to develop.

The working over of undesirable varieties of fruit trees can be continued. The pruning of grape vines should be done during the month, delaying the work as long as it is safe to do so, as the later the vines are pruned the less chance there is of their young growth being killed by late frosts. Keep the orchards well worked and free from weeds of all kinds, as the latter not only deplete the soil of moisture, but also act as a harbourage for many serious pests, such as the Rutherglen bug.

New vineyards can be set out, and, in order to destroy any fungus spores that may be attached to the cuttings, it is a good plan to dip them in Bordeaux mixture before planting. The land for vines should be well and deeply worked, and the cutting should be planted with one eye only out of the ground and one eye at or near the surface of the ground.

In the warmer parts which are suitable for the growth of citrus fruits, the land must be kept well cultivated, and if the trees need irrigating they should be given a good soaking, to be followed by cultivation as soon as the land will carry a horse without packing.

Fruit fly should be systematically fought, as it will probably make its appearance in late citrus fruits and loquats; and if this swarm of flies is destroyed, there will be every chance of the early crops of plums, peaches, and apricots escaping without much loss.

Farm Notes

SEPTEMBER.

With the coming of warmer weather, weeds of all kinds will be making their appearance on cultivated land, and among row crops, but in the latter instance, they can be effectively dealt with by inter row cultivation, and where necessary, by the use of the hoe.

Where crops are sown on thoroughly fallowed land, the greater freedom from weed infestation is at once apparent when compared with adjacent paddocks which have merely received a hurried preparation, so that any effort to sow clean seed on clean land is amply rewarded in the resultant clean crops, and higher returns.

Potatoes planted during July and August will now be making growth, and should be sprayed with Bordeaux mixture as a preventive of blight, particularly if cool, moist weather is experienced. Bordeaux and Burgundy mixtures are not regarded as a cure for blight, but the spray forms a satisfactory protective covering, which, if applied at intervals during growth, will effectively prevent the disease. Where land has received adequate preparation, forming a satisfactory seed bed, and has a sufficiency of subsurface moisture to induce germination, early sowings of maize, sorghum, Sudan grass, millets, cowpeas, pumpkins, etc., and the planting of sweet potato cuttings can be proceeded with, the farmers' chief concern being to provide a sufficiency of summer growing fodder and grain crops, both for current needs, and for storage as seasonal reserves.

The spring maize crop is usually considered an uncertain proposition for grain, as the warm, moist conditions desired during the tasselling period do not always eventuate, but as excellent crops are sometimes obtained, the risk is well worth while, especially as the fodder provided can always be put to good use in the event of a failure for grain.

Early maturing Yellow Dent varieties, such as "Funks 90 Day" will be found the best for early sowing, as they have the ability to make the best use of available moisture.

The market prices obtainable are also a consideration, as although early sown maize is usually intended for farm use, any surplus can be disposed of at prices in excess of those obtainable for the main crop at a later date.

Sweet potato cuttings will now be obtainable, and attention is directed to this valuable crop, which will thrive over a much greater range of climatic and soil conditions than will the English potato.

There is scarcely a farm throughout the State that would not benefit from a patch of sweet potatoes, to be utilised for culinary and stock feeding purposes. They are not always profitable as a market proposition, but considerable improvement in this direction is possible if well graded tubers of suitable cooking varieties only are marketed.

THE GREATNESS OF THE FARMER.

The farmer is a great man, but does not know it. He never claims to be an authority, even in his own business, and that is one of the reasons why so many officious people presume to give him advice. In every walk of life it is the fellow who cannot do things who sets himself up as a critic of those who can, and do a big, worth-while job.

The farmer seldom defends himself from his critics; he is too busy fighting nature—whether in the form of drought or a grasshopper plague, or the hundred and one other difficulties that beset the land industries.

The farmer is a student of soils, of the life of seeds and plants and animals. The secrets of nature can only be learned by careful thought and observation, and any man who has succeeded as a farmer has more knowledge of real life and more courage to face its emergencies than most men of the city.

The farmer has worked hard enough and has learned enough from the very beginning of time to feed, clothe, and shelter mankind. Who could do better?

Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

CARE OF THE PREMATURE BABY.

OUR ante-natal work aims at keeping the expectant mother well and enabling her to carry her child to full term.

Many babies are born prematurely, and the mortality amongst them is high. In order to have a reasonable chance of surviving the premature infant needs special care. His weight is generally less than 5 lb., but infants weighing 2 lb. may survive when properly cared for. Any baby born weighing less than 5 lb. should be treated as premature. Infants six weeks or more premature are usually weak, unable to suck, have a feeble cry or are unable to cry at all.

In order to help her the mother should secure the services of a child welfare trained nurse if possible.

The points to keep in mind are:—

1. Prevention of chilling.
2. Careful feeding with mother's milk.
3. Avoidance of unnecessary handling.
4. Avoidance of exposure to infection.

In order to prevent chilling the baby is not bathed, but is smeared over quickly with a piece of cotton wool dipped in warm olive oil and wrapped in cotton wool or soft flannel. In order to hold the cotton wool in position it is covered with butter muslin. A bonnet and jacket may be made by lining the cotton wool inside and out with butter muslin.

If a prepared cradle is not ready to hand half a dress basket makes a very suitable one. This is lined inside (sides and bottom) with brown

paper or newspaper to prevent escape of heat. Inside this the basket is lined with a piece of old blanket or flannel or a woollen scarf. This is fixed in position by stretching it round the sides of the basket outside so that it reaches from the top edge to the bottom. Fasten the strip of material used by means of a string tied all the way round immediately below the edge, or by sewing through the material and basket at intervals. Now take the bottom border of the material, turn it over the top edge into the basket, and press it against the sides all round. Throw a single blanket over the basket so that it reaches to within about 8 inches of its head. Place a thin, firm pillow in the bottom of the basket and a soft one over it to form a mattress. A pillow stuffed with oaten chaff makes an excellent mattress into which the child sinks. Premature babies chill so easily that it is necessary to warm the cradle. This is done by means of hot water bags. If these are not available stone bottles may be used. In cold weather three are required—one at the foot of the cradle under the upper pillow forming the mattress, the others between the mattress and the side of the cradle, not against the baby's body. The bag at the foot is filled with two cups of boiling water and one cup of cold water, the bags at the sides with one and a-half cups of boiling water and one and a-half cups of cold water. Into this warmed cradle baby is placed wrapped in his cotton wool jacket and covered loosely with a light shawl. One side of the blanket which passes under the mattress is carried across the baby's body to the other side of the cradle, where it is tucked in firmly under the mattress so as to include the hot water bag. Now the other side of the blanket is taken, carried across the baby's body, and tucked in similarly on the opposite side. In cold weather these bags require to be refilled in rotation, one every hour.

Providing his bed is kept at a temperature between 90 deg. and 95 deg. Fahr., which is taken by means of a dairy thermometer placed under the blanket midway between the child and the bottle at one side, the premature infant should be kept in a properly ventilated room. Guard against overheating in the hot weather and against sudden changes in the atmospheric temperature.

Do not put him into a bath until he weighs 5 lb. or more and is able to cry lustily. Begin by sponging one part at a time until his whole body is sponged, and later place him in a bath.

Feeding is Important.

Though the baby may live and thrive on an artificial food he is much more likely to do so if he is fed on breast milk. Usually the baby is unable to suck the breast until he weighs nearly 5 lb., and then he is able to do so for short periods only. The milk will require to be expressed from the mother's breast at first. In the case of very premature and feeble infants feeding will require to be carried out by means of a pipette or eye-dropper, and later by a pipette with a teat attached. In such cases only one or two teaspoonfuls of fluid may be taken at each feed, and twenty to thirty minutes may be occupied in giving this, a few drops at a time. Much patience and care must be exercised, and the swallowing movements observed before a drop or two more is expressed into the lower side of the child's mouth as his head is turned to one side. When he is able to swallow such a small amount he may require to be fed every hour for the first twenty-four or forty-eight hours.

Begin by giving warm boiled water as much as he will take without being fatigued, perhaps one teaspoon every hour. For a bady weighing 2½ lb. about 3 oz. of boiled water may be given during the first twenty-four hours. If there is delay in the secretion of breast milk whey may be given temporarily. When the baby is able to take two teaspoons in twenty to thirty minutes comfortably, feed him one and one-half hourly for a day or two, then two hourly, giving him sixteen, then twelve feeds in twenty-four hours. When expressed breast milk is available feed with equal parts breast milk and boiled water or boiled whey. As he takes his food more readily gradually increase the quantity of his mixture so that at the end of a week or ten days he may be taking 4½ to 6 oz. in twenty-four hours, that is three to four teaspoons two hourly. When he is taking his allowance well, give him boiled water in addition so that the total amount of fluid he receives is equivalent to 3 oz. for every 1 lb. of body weight. He may be kept on two hourly feeds until he has gained 1 lb. in weight, when he may receive ten feeds instead of twelve in twenty-four hours, namely two hourly, 6 a.m. to 6 p.m., three hourly, 9 p.m. to 3 a.m. When he is about three weeks old he may be taking 7½ oz. of his mixture composed of equal parts of breast milk and whey and 1¾ to 2 oz. boiled water during the twenty-four hours. At one month he may be taking 9 oz. of his mixture and 3 oz. of water. Be guided by his capacity to take the mixture and by his weight. He may gain scarcely any weight during the first week, during the second he may gain 2 to 3 oz., and by the time he is one month old he may have gained 9 to 10 oz. on this mixture. Be content while he is gaining strength and weight. Do not exceed his tolerance for food. There is a real risk of an upset which may prove serious.

Do not remove him from his cot to feed or oil him. Handle the premature infant as little and as gently as possible while attending to him. Turn him from one side to the other every four hours.

Allow as few visitors as possible to see him, particularly keep away anyone suffering from a cold or other infection. If the mother herself happens to be suffering from a cold it is wise for her to tie two layers of gauze over her nose and mouth when attending to the baby.

BOTANY FOR QUEENSLAND FARMERS.

Mr. David G. Stead, President of the Naturalists' Society of New South Wales, writes—

Reference, C. T. White's Principles of Botany.—Please allow me to congratulate you on the issue of this splendid work,* which is quite unique among such publications. Mr. White has performed a most meritorious service, not only for Queensland, but for the whole of Australia, in writing this fine book, while the Queensland Government is to be thanked for its great discernment of the value of a really useful publication in issuing it in such a fine, permanent format, so well got up in the matter of printing and illustrations.

This book will prove of lasting use and benefit as a contribution to a practical understanding by farmers and by other citizens of Australia of the basic principles of Nature that are to be studied if they are to be successful in dealing with the primary products of the land. At the same time, the fund of useful information about our trees and many native shrubs, is of the greatest practical utility to every student.

One should add here that the issuing of the work at such a low price is also an evidence of the liberal foresight of the Queensland Government in its recognition of the fine practical usefulness of the book.

**Principles of Botany for Queensland Farmers.* By C. T. White, Government Botanist; issued by the Department of Agriculture and Stock. Price, 2s.

IN THE FARM KITCHEN.

VARIATIONS IN STEWS.

Stewed Veal Chops.

Take 6 tender veal chops, 1 large tomato, 1 onion, 2½ gills white stock, 1 teaspoonful grated orange-rind, 1 stalk celery, 4 tablespoonfuls butter or bacon fat, 1 blade mace, 2½ tablespoonfuls flour, 1 carrot, pepper and salt to taste.

Beat and trim chops. Season with pepper. Melt one and a half tablespoonfuls butter in a deep frying pan. Brown chops on each side for three minutes. Season to taste with salt. Cook another three minutes on each side. Add minced carrot, celery, and onion, and chopped and peeled tomato. Cover with two gills of the boiling stock, then cover pan. Simmer ten minutes. Melt remainder of butter in another frying pan. Stir in orange rind and mace. Cook for five minutes. Add flour and remainder of stock. Bring to the boil. Pour over the chops and vegetables. Cover and cook ten minutes. Uncover. Remove mace. Serve on a hot dish.

Stewed Knuckle of Veal.

Take 1 lb. knuckle veal, 1 small onion, 1 oz. flour, 1 oz. butter, seasoning.

Wipe the meat. Melt the butter and fry onion, cut in thin slices. Add half a pint of water and boil. Place the veal in and stew gently for three hours. When tender, lift out the meat and place it on a hot dish. Thicken the sauce with the blended flour and pour over the meat. Garnish with watercress and serve with salad.

Stewed Kidney and Rice.

Take 4 sheep's kidneys, 1 medium onion, ½ pint stock, 6 oz. rice, 2 tablespoonfuls dripping, 4 oz. grated cheese, 1½ tablespoonfuls flour, 1½ tablespoonfuls lemon juice, 1½ teaspoonfuls French mustard, pepper and salt, parsley to garnish.

Wash, skin, and core kidneys, then cut into dice. Melt fat in a saucepan. Dip kidney in flour and salt and pepper to taste, and fry until brown, then remove to a plate. Peel and slice onion, and fry slowly until golden, adding more fat if required, then remove to plate, and brown remainder of flour. Stir in stock and bring to the boil. Boil until smooth, stirring constantly, then add kidney, onion, and mustard. Cover and simmer for one hour or until kidney is tender, then add lemon juice. About half an hour before kidney is ready, place a pan half-filled with salted water on to boil. When boiling, wash and add the rice. Boil quickly uncovered until soft, then strain through a colander and return to pan. Add grated cheese and stir over a slow heat till melted. Arrange in a ring on a hot dish and pour the stewed kidney into the centre. Decorate with sprigs of parsley.

Stewed Lamb and Green Peas.

Take 1½ lb. middle neck of lamb, 1 pint water, 1 pint green peas, 1 onion, 1 oz. flour, 1 oz. dripping or bacon fat, salt and pepper to taste.

Melt the fat in a saucepan. When smoking hot, add the peeled and chopped onion and fry till brown and crisp. Remove the onion. Add the meat divided into suitable pieces for serving. Brown on both sides. Remove to a dish and drain off any remaining fat in the pan. Mix the flour to a paste with a little water. Turn into a saucepan. Stir in the remainder of the liquor. Keep stirring till boiling. Add the meat and onion and simmer for two and a half hours. Add drained tinned peas and bring again to the boil. If you use fresh peas, add them about twenty-five or thirty minutes before the stew is ready. If liked, a sliced carrot, one or two pieces of turnip, and one or two small onions can be added after the meat is cooked for one hour.

Stewed Breast of Lamb.

Take 1 breast of lamb, 1 oz. butter, ¾ oz. flour, white stock, 1½ pints peas, 1 blade mace, ¼ teaspoonful white pepper, potato balls, salt, gravy.

Remove skin from lamb, then cut meat into pieces. Place meat in a stewpan with mace and sprinkle with salt and pepper. Add enough stock to cover. Cover pan and simmer gently for three-quarters of an hour. Skim well and remove mace. Add two-third of the peas and simmer again for half an hour. Mix butter and flour together. Stir into gravy in small pieces, so that all dissolves. Simmer for ten minutes. Remove meat carefully and arrange on a dish. Pour sauce over. Garnish with potato balls and remainder of peas, plainly boiled.

Stewed Tripe with Tomato Sauce.

Take 2 lb. tripe, 3 tablespoofuls fat, tomato sauce, 2 tablespoonfuls flour, 1 chopped onion, boiling water.

Wash, dry, and cut tripe into small strips. Melt fat in a frying pan till smoking hot. Add onion and cook until brown. Stir in flour. When flour is brown stir in tripe and enough boiling water to cover—about one and a-half cupfuls. Turn into a casserole. Cover and simmer slowly for one or two hours, or until tender. Serve with tomato sauce.

Tomato Sauce.

Take ½ cupful water, 2 tablespoonfuls flour, salt and pepper, 2 tablespoonfuls margarine, ¼ teaspoonful minced onion, 1 gill sieved tomato.

Melt butter in a saucepan. Remove pan from gas and stir in the flour. Add water. Stir well. Add tomato puree, minced onion, and seasoning to taste.

Stewed Mushrooms.

Take ½ lb. mushrooms, 1 pint stock, 1 oz. butter, juice ½ lemon, seasoning.

Peel the mushrooms and cut each into four (or they may be left whole). Stew gently for five minutes with one ounce of butter. Add seasoning, a little flour, and one pint of stock. Cook for ten minutes. Serve on toast. Sauce may be served separately. Add lemon juice before serving.

Stewed Brisket of Beef.

Take 2 lb. brisket, 2 tablespoonfuls dripping, ½ pint bean liquid, 1 pint butter beans, 2 tablespoonfuls flour, salt and peper to taste.

Sprinkle the meat with salt and pepper and stand for one and a half hours. Cover the beans with cold water and soak overnight. Drain the beans. Turn into a saucepan. Cover with fresh water. Bring slowly to simmering point, then add the meat, well browned in the dripping. Cover and simmer until meat and beans are tender. Re-heat the dripping in the frying pan. Stir in the flour, and when frothy gradually stir in half a pint of liquid from the stew. Pour the sauce into the saucepan. Cover and cook slowly for a moment or two; then serve the stew with well-mashed potatoes.

UNUSUAL FISH DISHES.

Fillets of Fish with Sausage-meat.

Take 1 lb. fish fillets, ½ lb. sausage-meat, 2 eggs, ½ pint to ¾ pint milk, salt and pepper to taste.

Wash and trim the fillets. Roll up each fillet with some of the sausage-meat inside; and arrange neatly in a glass fireproof dish, casserole, or pie-dish. Season well. Now pour over a custard made with the eggs and milk. Place in a moderate oven for about three-quarters of an hour. On no account cook too fast, or the custard will curdle. Serve immediately.

Spanish Hot Pot.

Place a layer of cooked, mashed potatoes in the bottom of a well-greased pie-dish. Cover alternately with layers of fried onion, raw sliced tomatoes, and pieces of uncooked fish dipped in flour. Sprinkle with knobs of dripping. Repeat the layers till the pie-dish is full, finishing with potatoes, dripping, and grated cheese. Bake till the fish is cooked, about half to three-quarters of an hour, and serve.

Quenelles of Whiting.

Take 1 large whiting (cooked and sieved), 1 gill milk, 3 oz. breadcrumbs, 1 oz. butter, 2 egg-yolks, 1 egg-white, anchovy essence, seasoning.

Soak the crumbs in milk, then squeeze them dry in a cloth. Melt the butter, add the crumbs, and leave over a gentle heat until the butter is absorbed. Add the sieved whiting, seasoning, and the egg, well beaten. Mix all well together. Shape into quenelles with two tablespoons. Butter a sauce-pan and lay on the quenelles. Pour over boiling water and poach gently for about ten minutes. Drain and serve coated with sauce. Serve en couronne, and fill up the space with green peas or French beans.

Russian Fish Pie.

Take ½ lb. fish (cooked or raw), 1 teaspoonful parsley, 1 oz. melted butter, 1 hard-boiled egg, 2 tablespoonfuls white sauce, grated lemon rind, seasoning, flaky pastry.

Free the fish from bones and flake very finely. Add seasoning, parsley, butter, sauce, and lemon rind. Grate the egg and mix all well together. Roll out the pastry into a square. Place mixture in the centre of pastry and fold up the four corners to the centre. Brush with egg and decorate with pastry-leaves. Bake in a hot oven and serve very hot.

Sole a la Creme.

Take 1 sole, 1 tablespoonful cream, seasoning, bay-leaf and mace, ¾ pint milk, lemon juice, 1 oz. butter, 1 oz. flour.

Skin and fillet the sole. Roll up the fillets after seasoning well. Sprinkle each with lemon juice. Heat the milk with the bay-leaf, mace, and seasoning. Strain and cook the fillets gently for a quarter of an hour in the liquid. Melt the butter and add the flour and half a pint of the liquid strained from the fish. Boil and add cream and extra seasoning. Pour the sauce over the fish and garnish with parsley and lemon.

Sole a l'Orly.

Take 1 sole, 1 small onion, 1 oz. grated cheese, 3 tomatoes, 1 teaspoonful chopped parsley, 1 teaspoonful anchovy essence, 1½ oz. butter.

Chop the onion and mix with the parsley and cheese. Melt the butter and add. Add anchovy essence. Skin the black side of the sole, and raise the two fillets. Stuff with the mixture. Place on a buttered dish, and cover with slices of tomatoes. Sprinkle a little grated cheese on the top and bake for twenty-five minutes. Serve very hot.

Flounder and Spinach Pie.

Take 1 lb. of fillet flounder, 1½ cupfuls white sauce, ½ gill water, 1 cupful cooked spinach, ½ gill milk, 1½ teaspoonfuls Parmesan cheese, 3 tablespoonfuls grated cheese, salt and pepper to taste.

Butter a shallow fireproof dish. Fold fillets in two. Place in dish side by side. Season with salt and pepper to taste. Add milk and water. Cover with a buttered paper. Cook in a moderate oven for fifteen minutes, or till milky white all through. Drain well. Butter another shallow fireproof dish. Line with the spinach. Lift fillets carefully from other dish and arrange side by side on top of the spinach. Stir cheese into sauce. Stir in a dash of made mustard, if liked. Pour over fish, sprinkle with grated Parmesan. Bake in the top of a hot oven or brown under the grill.

Skate Steaks with Tomato Puree.

Take 2 or 3 skate steaks, 1 inch thick, 2 teaspoonfuls butter, small piece onion, salt, cayenne pepper, 2 tomatoes, ½ pint fish stock, 2 teaspoonfuls flour, blade of mace, lemon juice.

Dry the fish with a cloth, sprinkle with salt and pepper, and lemon juice on the under side. Lay it on a buttered plate with another plate on top, and set it on a saucepan of boiling water for half an hour till the fish leaves the bone. Lift it on to a cloth to drain, then lay on a hot meat dish. Warm the butter and fry the tomatoes and onions sliced, add flour, mace, and seasonings, and fish liquid, and cook twenty minutes. Rub through a sieve. Return to saucepan to heat, then pour over fish. Sprinkle with chopped parsley.

FOR BIRD LOVERS.

Bird-lovers will find that an attractive and inexpensive bath can be made for their feathered pets in the following way:—

Take a tile sewer pipe about 3 feet long, push it will into the ground for several inches, keeping the tile upright. Tie a weight to the lid of a discarded rubbish tin by the handle. Invert the lid on top of the pipe, allow the weight to swing inside, thus holding the lid in position. Finally paint the whole with two coats of any paint considered most suitable, and you will be delighted with the result.—E.E.S. in the "*Sydney Morning Herald.*"

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JUNE, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1938 AND 1937, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. June.	Average Rainfall. No. of years' records.	Total Rainfall. June, 1938.	Total Rainfall. June, 1937.
North Coast.	In.		In.	In.
Atherton	1·65	37	1·40	0·25
Cairns	2·85	56	2·25	0·30
Cardwell	2·02	66	2·23	0·83
Cooktown ..	1·99	62	2·01	0·03
Herberton ..	1·15	52	0·75	0 07
Ingham	2·39	46	4·15	1·51
Innisfail	7·20	57	7·41	3·19
Mossman Mill ..	2·46	25	1·67	0·70
Townsville ..	1·37	67	0·68	0·75
Central Coast.				
Ayr	1·48	51	0·25	0·48
Bowen	1·65	67	0·49	1·54
Charters Towers ..	1·33	56	0·28	1·90
Mackay	2·73	67	2·40	1·88
Proserpine ..	3·36	35	1·57	1·56
St. Lawrence ..	2·50	67	0·95	1·40
South Coast.				
Biggenden ..	2·22	39	1·49	0·92
Bundaberg ..	2·85	55	2·48	1·26
Brisbane	2·68	86	0·86	0·73
Caboolture ..	2·65	51	1·07	1·14
Childers	2·45	43	1·50	0·79
Crohamhurst ..	4·42	45	2·88	1·74
Esk	2·20	51	0·33	1·16
Gayndah	1·82	67	0·98	0·72
Gympie	2·66	68	1·35	1·21
Kilkivan	2·11	59	0·88	1·16
Maryborough ..	3 00	67	2·18	1·63
Nambour	3·71	42	3·52	1·94
Nanango	1·97	56	0·75	1·29
Rockhampton ..	2·57	67	1·27	1·60
Woodford ..	2·86	51	0·69	1·51
Central Highlands.	In.		In.	In.
Clermont ..	1·68	67	1·69	1·70
Gindie	1·43	39	..	0·84
Springsure ..	1·76	69	2·52	0·92
Darling Downs.				
Dalby	1·66	68	0·90	1·04
Emu Vale ..	1·48	42	0·50	0·78
Hermitage ..	1·71	32	..	0·51
Jimbour ..	1·63	50	0·58	0·79
Miles	1·75	53	0·74	0·68
Stanthorpe ..	1·90	65	0·47	1·33
Toowoomba ..	2·36	66	0·88	1·19
Warwick ..	1·73	73	0·42	0·68
Maranoa.				
Roma	1·55	64	0·80	0·50
State Farms, &c.				
Bungeworgorai ..	1·26	24	..	0·32
Gatton College ..	1·80	39	..	0·82
Kairi ..	..	..	..	..
Mackay Sugar Experiment Station	2·47	41	..	1·57

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JUNE, 1938.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·94	80	71	84	7, 28	67	15	201	13
Herberton	..	71	56	82	7	47	19	75	7
Rockhampton	30·11	72	56	79	9	45	21	127	6
Brisbane	30·17	69	52	77		41	28	86	8
Darling Downs.									
Dalby	30·18	67	42	76	7, 8	28	21	90	6
Stanthorpe	..	59	35	69	9	21	28	47	4
Toowoomba	..	62	42	72	7, 8, 9	31	28	88	5
Mid-Interior.									
Georgetown	29·98	84	59	89	28, 29	44	28	32	2
Longreach	30·10	75	50	85	9	40	2	134	6
Mitchell	30·17	65	43	77	7	29	21	115	5
Western.									
Burketown	29·99	84	62	89	20	55	27	..	..
Boulia	30·07	74	50	85	8	40	27	24	2
Thargomindah	30·10	65	48	74	6	39	5, 6	106	4

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	August. 1938.		Sept. 1938.		MOONRISE. Aug., 1938.	MOONRISE. Sept. 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·35	5·21	6·7	5·37	9·42	10·21
2	6·34	5·22	6·6	5·37	10·20	11·11
						p.m.
3	6·33	5·23	6·5	5·38	11·0	12·1
4	6·33	5·24	6·4	5·38	11·42	12·49
					p.m.	
5	6·32	5·25	6·3	5·39	12·26	1·40
6	6·31	5·25	6·2	5·39	1·14	2·33
7	6·31	5·26	6·1	5·40	2·2	3·26
8	6·30	5·26	5·58	5·40	2·55	4·17
9	6·29	5·27	5·57	5·41	3·47	5·12
10	6·28	5·27	5·56	5·41	4·37	6·6
11	6·28	5·28	5·55	5 42	5·32	7·2
12	6·27	5·28	5·53	5·42	6·25	7·59
13	6·26	5·29	5·52	5·43	7·18	8·57
14	6·25	5·29	5·51	5·43	8·10	9·57
15	6·24	5·30	5·50	5·44	9·7	10·57
16	6·23	5·30	5·49	5·44	10·4	11·58
17	6·22	5·31	5·48	5·45	11·5	..
						a.m.
18	6·21	5·31	5·47	5·45	..	12 56
					a.m.	
19	6·20	5·32	5·45	5·45	12·3	1·49
20	6·19	5 32	5·44	5·46	1·5	2·39
21	6·18	5·33	5·43	5·46	2·5	3·25
22	6·18	5·33	5·42	5·47	3·4	4·6
23	6·17	5 33	5·41	5·47	3·55	4·48
24	6·16	5·34	5·40	5·47	4·45	5 30
25	6·15	5·34	5·39	5·48	5·32	6·9
26	6·14	5·35	5·38	5·48	6·15	6·48
27	6 13	5·35	5·37	5·49	6·53	7·32
28	6·12	5·36	5·36	5·49	7·35	8·19
29	6·11	5·36	5·35	5·50	8·15	9·2
30	6·10	5·37	5·34	5·50	8·57	9·50
31	6·9	5·37			9·39	

Phases of the Moon, Occultations, &c.

3rd Aug., ☽ First Quarter 12 0 p.m.
11th „ ○ Full Moon 3 57 p.m.
99th „ ☾ Last Quarter 6 30 a.m.
25th „ ● New Moon 9 17 p.m.

Apogee, 8th August, at 1.0 p.m.
Perigee, 23rd August, at 3.0 a.m.

Among the stars of the far distant Zodiacal Constellations, through which the planets pursue their course, we can trace their movements, though in the case of Jupiter and Saturn, amongst inconspicuous stars, not to the best advantage at present.

Mercury will reach its stationary point on the 13th, after which it will rapidly decline in altitude until on the 28th it will be lost in the Sun's rays and disappear from the evening sky.

About the middle of the month, when Jupiter, in Aquarius, has arisen Mercury will be low down in the west and Venus, in Virgo, above it.

On the last day of the month Venus will pass the first magnitude star Spien close to the ecliptic.

Mercury rises at 7.57 a.m., 2 hr. 6 min. after the Sun, and sets at 7.23 p.m., 1 hr. 22 min. after it, on the 1st; on the 15th it rises at 7.13 a.m., 49 min. after the Sun, and sets at 7.7 p.m., 1 hr. 37 min. after it.

Venus rises 8.49 a.m., 2 hr. 14 min. after the Sun, and sets at 8.33 p.m., 3 hr. 11 min. after it, on the 1st; on the 15th it rises at 8.32 a.m., 2 hr. 8 min after the Sun, and sets at 8.52 a.m., 3 hr. 22 min. after it.

Mars rises at 6.30 a.m. and sets at 5.10 p.m. on the 1st; on the 15th it rises at 6.4 a.m. and sets at 4.58 p.m.

Jupiter rises at 6.52 p.m. and sets at 7.52 a.m. on the 1st; on the 15th it rises at 5.50 p.m. and sets at 6.58 a.m.

Saturn rises at 10.34 p.m. and sets at 10.18 a.m. on the 1st; on the 15th it rises at 9.37 a.m. and sets at 9.25 p.m.

At about 9 o'clock at the beginning of the month and two hours earlier at the end the Milky Way from south-west to north-east will be most luminous near the Southern Cross and at the zenith near Scorpio and Sagittarius North-eastward it can be traced through Aquila, the Eagle (with the bright star Altair and a smaller one on each side of it) and to the horizon through Cygnus, the Swan. The latter constellation contains the figure of a Cross (The Northern Cross) inverted in our Hemisphere. The head of Cygnus is a small star between Altair and the brilliant white star Vega in Lyra, its wings stretch out beyond the Milky Way; the largest star, Deneb, nearest the horizon marks its tail.

2nd Sept. ☽ First Quarter 3 28 a.m.
10th „ ○ Full Moon 6 8 a.m.
17th „ ☾ Last Quarter 1 12 p.m.
24th „ ● New Moon 6 34 a.m.

Perigee, 20th September, at 10.0 p.m.
Apogee, 5th September, at 3.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises; and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

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Event and Comment

The Brisbane Show.

AS a centralised aggregation of decentralised effort and enterprise, the Brisbane Exhibition always presents an impressive spectacle; and this year it outshone all previous shows. Judging by its representation of the extraordinary range of rural production and diversity of country interests in Queensland, it is difficult to imagine a limit on any estimation of future advancement. The attainment of high standards under the stimulus of healthy competitive effort was exemplified in every farm exhibit and in every animal paraded. No more convincing evidence of the State's immense agricultural and pastoral capacity could be presented.

At the opening ceremony, his Excellency the Governor, Sir Leslie Wilson, said that the people of Queensland had every reason to be grateful to the Royal National Agricultural and Industrial Association. "I congratulate you," he added, "on the progress you have made, and I am confident from what I have seen that yours is no idle boast when you say that this is the finest Show yet put before the citizens of Queensland."

Continuing, his Excellency said that great men with great pioneering spirit had passed away in recent years, and particularly this year. He would add, also, the names of some women who, in their way, really gave just as great services to the State. The work of these great-hearted men and women should be put on record for all time. Possibly some of those who realised how much they owed to the pioneers would help towards this end in the establishment of a historical museum.

He had a great belief in the future of Queensland. This Show demonstrated the State's great assets, but without the beneficent generosity of Divine Providence they could have availed nothing.

The Show was an advertisement of the best that Queensland could produce. The exhibits were a record in number and, he believed, in quality, for Queensland and the exhibitors had done all in their power—often at a great financial sacrifice.

It was right they should look back with gratitude to the early pioneers, but they should also look forward to the future, so that they might leave to those who came after a State whose foundations had been well and truly laid. It was his fervent hope that the spirit of their work would be an example to everyone who had at heart—as every Queenslander should—the welfare of his country. They should do all in their power to utilise the gifts with which they had been blessed to the greatest benefit of the greatest number of citizens.

The Show was worthy indeed of a great State, and demonstrated that Queensland not only could but intended to produce the best. The Show must send into the hearts of all who saw it a message of encouragement and hope for the future.

Conservation of the State's Rural Resources.

SPEAKING at another official function later in the day, his Excellency remarked that the Brisbane Exhibition could not have been staged if it had not been for the work of district shows, and he wished to pay tribute to their wonderful contribution to the State's progress. Optimism was sometimes a danger, because it meant they were a little self-satisfied and complacent. They could not afford to be that, but must strive for even better things. He was such an ardent advocate for better water supply that he felt he could talk about it until "the cows came home." Water was a priceless gift to Queensland, but geologists stated that it had been misused and neglected in the past. Only a fortnight before he had seen artesian bores which had gone dry and had become sub-artesian.

The felling of scrub, ringbarking, and the denudation of timbers were other examples of the tendency to draw too heavily on Nature without helping it to replenish the supply.

It was gratifying that water conservation and irrigation would play an important part in the Government's programme of development outlined to Parliament recently.

He realised they must proceed slowly, but they should go ahead with surveys and research, and use every means in their power to ensure a plentiful water supply for the future.

The Royal National Association was doing great work, and nobody realised it more fully than he.

National Development a Vital Principle.

ACKNOWLEDGING the toast of Parliament at the same function, the Premier, Hon. W. Forgan Smith, said Parliament had greater significance to-day than at any other time in history. In electing Parliament the people gave certain men or women power of attorney to implement a policy in the interests of the community. Parliament at one time was regarded as an organisation that should interfere as little as possible with industry, trade, and individuals. That sounded very nice in theory, but other people were clamouring for it to legislate for their welfare. It was an inevitable development that Parliament should enter more and more into the affairs of life, and control industry on behalf of the whole people and not of a section, continued the Premier. Whether they liked it or not, people were living to-day in the social state, and Parliament was expected to give a lead. This meant that it had an increased responsibility. Though parliamentarians might differ on matters of fundamental policy, as men of sound character they could not differ on vital principles, the first and most vital of which was to develop this country.

"Queenslanders must enter manfully into possession of their great natural heritage and use it effectively, not alone for their generation, but for the future of a great Commonwealth," said Mr. Smith. "They should stand, also, for the vital principles that all men and women shall be free; that every child shall have the right to be born clean and healthy, to be loved and cared for, and educated and trained as a good citizen."

If any institution became corrupt or effete it would be replaced by one nearer to the hearts, minds, and souls of the people. Therefore, Parliament as they understood it to-day could be strengthened only by the intelligent support of the people who elected it. In carrying out their duty for the greater good of the people, governments might have to do things that were unpopular at the moment. But time would demonstrate their soundness.

The Show an Inspiration.

SPEAKING of the work of the Royal National Agricultural and Industrial Association, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that few people appreciated the amount of work the leaders of the Association gave willingly to the State in pursuit of an ideal. The Show crystallised the activity and thought of the previous twelve months, and he congratulated those who had made this possible. Nations whose feet were planted firmly in the soil of their country ultimately found themselves on the highest plane, and for that reason the Exhibition was not only a fruitful display but an inspiration for future performance.

One of the problems facing Queensland was how to promote the quality of agricultural products, and how to attain a level at least equal to that maintained by competitors in, say, the markets of the United Kingdom, continued Mr. Bulcock. Cultural problems sank to comparative insignificance when confronted with that. It was because the outstanding performance of to-day became the commonplace of to-morrow that the Royal National Association, concentrating the State's best in its Annual Show, was an inspiration rather than an institution.

Codling Moth Control Experiments, 1937-38.

KEIGHLEY M. WARD, M.Agr.Sc., Research Officer, and A. A. ROSS, Assistant to Research Officer.

IN seeking methods by which an improvement in the control of codling moth might be achieved, two main aspects of the problem must be investigated. In the first place, any alternative spray schedule should compare favourably in efficiency with lead arsenate and at the same time obviate the accumulation of arsenical residues on mature fruit; the cost of such a schedule should not be disproportionate to that of the lead arsenate schedule. In the second place, if the most effective results are to be obtained from a minimum number of sprayings, the practicability of timing spray applications according to the activity of the moth must be determined.

In the Stanthorpe district, the various spray schedules in use rely to a considerable extent on lead arsenate for the control of codling moth. To minimise arsenical residues, some growers employ white oil for the later cover sprays. Whatever cover spray is adopted, times of application frequently bear little or no relation to moth activity. As the moths usually appear in a series of waves during the season, and egg-laying is therefore more active at some periods than at others, the correct timing of cover sprays is particularly desirable.

The 1937-38 programme of work was designed to ascertain the relative efficiency of certain spray schedules and to record the activity of adult moths under orchard conditions with a view to devising a practicable method of timing spray applications.

EXPERIMENTAL METHODS.

In designing the orchard spraying trial, two important sources of variation which occur in any orchard were taken into account. These are (i.) the variation in infestation between different trees; in this experiment, for example, the amount of infested fruit on individual unsprayed trees ranged from 13 per cent. to 64 per cent.; and (ii.) the variation in the number of fruits produced on different trees; in the present case, the number of apples borne by individual trees varied from 66 to 1,355. In the absence of information on the probable variation in infestation, a randomised block layout was employed in which seven treatments, including controls, were replicated six times on plots of four trees each, arranged in a square. The experiment was laid down on 168 Granny Smith apple trees. Since this variety matures late, the fruit was subject to codling moth attack for practically the whole of the season. The trees were eighteen years of age.

The experimental results were analysed after an examination of the whole crop from each tree. The fruit, when harvested, was sorted into three groups, namely, uninfested, infested—calyx entrance, and infested—side entrance. An apple was classed as "infested" only when a larva had actually entered the fruit or caused a definite injury; so-called "stings"—*i.e.*, fruit with slight surface injury but not entered by larvæ—were classed as uninfested fruit. Wind-fallen fruit, collected at intervals through the season, was similarly classified, and the figures

were included in the total yield per tree for analytical purposes. A total of 101,888 apples, approximately 680 cases, was harvested from the experimental trees.

Adult moth activity was studied with the aid of lure traps which consisted of vinegar or molasses solutions. The traps were maintained throughout the season in the experimental orchard at The Summit, and also at another orchard about 5 miles away at Applethorpe. Forty traps were employed and the number of moths caught was recorded twice weekly. The lure was renewed fortnightly.

The cocooning behaviour of the larvæ was observed by means of bands or shelter traps made from plain corrugated cardboard strips, 3 inches wide, placed on the trunks of twenty-four apple trees. The bands were removed twice weekly and the numbers of larvæ trapped were recorded. Temperature and humidity records were kept for the period of the observations.

Codling moth life history studies were carried out at the Stanthorpe laboratory and general observations were made in several orchards.

TREATMENTS.

The spray schedules tested in the 1937-38 season are set out below:—

1. White oil—nicotine sulphate (1¼ gallons—1 pint—80 gallons) applied in both calyx and cover sprays.
2. Nicotine sulphate with a white oil spreader (1 pint—1 quart—80 gals.) applied in both calyx and cover sprays.
3. Lead arsenate (2½ lb.—80 gals.) applied in both calyx and cover sprays.
4. Lead arsenate (2½ lb.—80 gals.) as a calyx spray followed by white oil (1¼ gals.—80 gals.) as cover sprays.
5. Potash soft soap (10 lb.—80 gals.) applied in both calyx and cover sprays.
6. Colloidal sulphur—nicotine sulphate (2½ lb.—1 pint—80 gals.) applied in both calyx and cover sprays.
7. Controls—untreated.

Sprays were applied four times during the season on the following dates:—calyx spray—13th October; cover sprays—4th November, 23rd December, 14th February. The greater part of the fruit was harvested between 19th February and 10th March.

RESULTS.

The results of this experiment are summarised in Table I. where a comparison is made between the six different spray schedules. Each of these figures is based on the crop yielded by twenty-four trees receiving similar treatment.

In examining the results it is essential to bear in mind that *only differences of 9·24 or over in the percentage control given by different treatments can be taken as reliable or "significant."*

The first four schedules have all exercised a controlling effect over the moth, as is shown by a comparison with unsprayed trees. They do not differ significantly from each other and therefore must be classed,

in this experiment, as equally effective. Whilst none gave better control than Schedule 3 in which lead arsenate alone was used, three of the Schedules (1, 2, and 4) embodying non-arsenical cover sprays, were equally efficient.

The mixture of 1 pint of nicotine sulphate plus 1 quart of white oil (Schedule 2) controlled the moth as well as 1 pint. of nicotine sulphate plus 1⅓ gals. of white oil (Schedule 1). Of these two sprays, the second is, of course, more expensive than the first.

TABLE I.—SHOWING RELATIVE EFFICIENCY OF VARIOUS SPRAY SCHEDULES IN 1937–38 EXPERIMENTS.

Schedule.	% Uninfested Fruit.	Significantly Exceeds.	Number Apples Examined.
1. White oil-nicotine sulphate calyx and cover sprays	78.98	5, 7	11,772
2. Nicotine sulphate-white oil spreader calyx and cover sprays	79.70	5, 6, 7	15,071
3. Lead arsenate calyx and cover sprays ..	79.42	5, 6, 7	15,559
4. Lead arsenate calyx followed by white oil cover sprays	82.18	5, 6, 7	16,308
5. Potash soft soap calyx and cover sprays..	59.78	..	15,211
6. Colloidal sulphur-nicotine sulphate calyx and cover sprays	70.15	5	12,982
7. Control—Unsprayed trees	63.42	..	14,985
Total	..	..	101,888

Standard error = 3·2

Significant difference = 9·24

F for treatments = 7·81 which is highly significant (P. $<$ ·01).

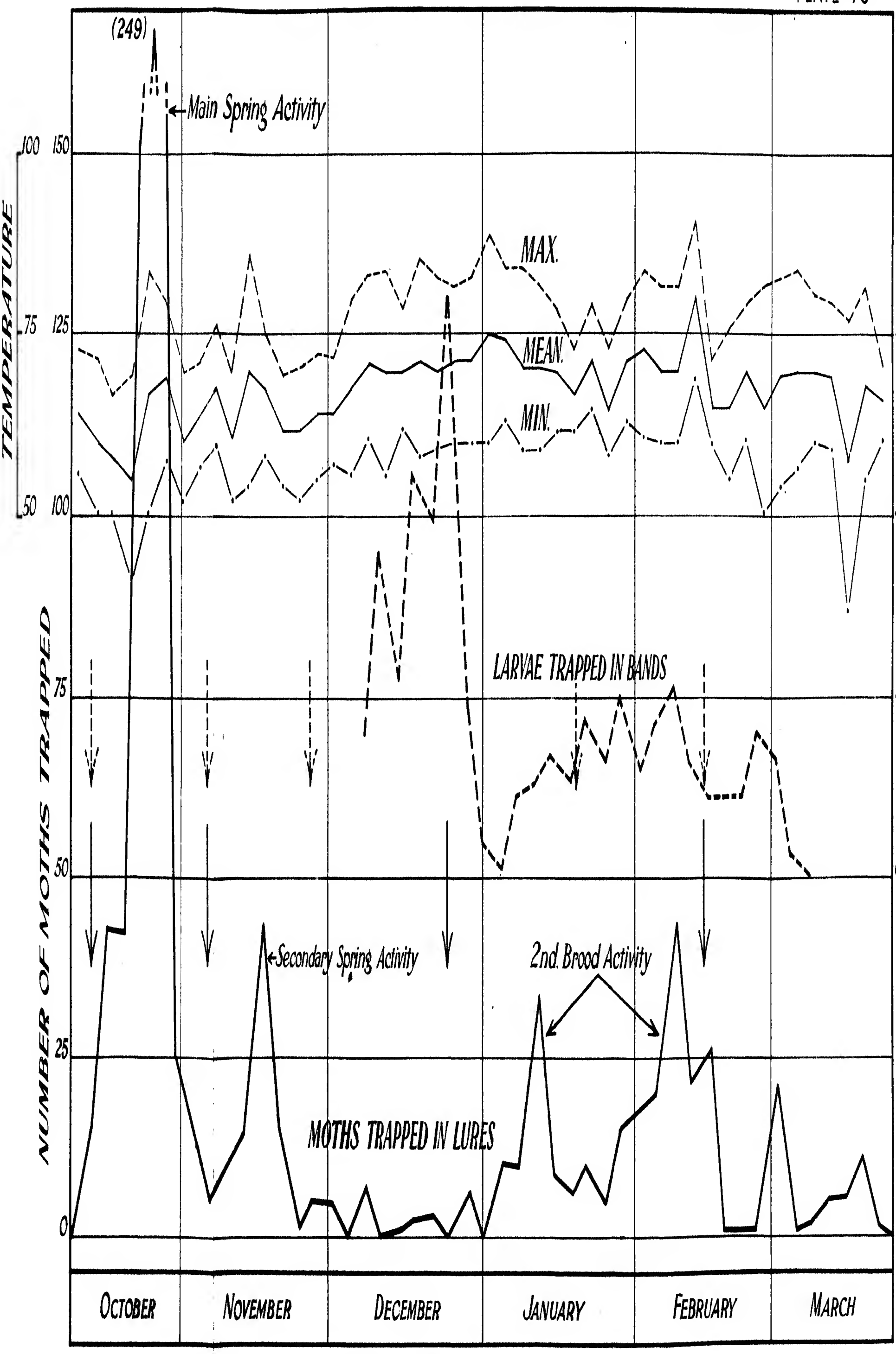
The percentage of uninfested fruit obtained from trees sprayed with potash soft soap (Schedule 5) was not significantly different from that obtained from the unsprayed trees, *i.e.*, potash soap has failed in this experiment to control the insect. This observation was supported by a laboratory test in which codling moth eggs were treated with the same spray. The results were as follows:—

	No. eggs treated.	Per cent. eggs not hatching.	Per cent. eggs killed by treatment.
Potash soap	150	31·3	24·2
Untreated	150	9·3	..

Since only 24·2 of the eggs was killed by the spray, potash soft soap cannot be considered an effective ovicide.

Colloidal sulphur plus nicotine sulphate (Schedule 6), though somewhat more effective than potash soft soap, has also given disappointing results. As this mixture was less effective than Schedules 1 and 2 containing nicotine sulphate plus white oil sprays, it seems that white oil may have an activating effect on the nicotine sulphate, which is not exerted by the colloidal sulphur.

The four best treatments gave approximately 80 per cent. sound fruit, which can scarcely be considered adequate control, although it is



CODLING MOTH ACTIVITY AT STANTHORPE, 1937-38.

probably as good, if not better, than that obtained in many orchards. Better control might have been procured if lead arsenate calyx sprays had been employed in all schedules and if cover sprays had been applied shortly after the November and January peaks of moth activity (see Plate 76). The December spray could probably have been dispensed with. In view of the fact that the season was favourable for codling moth infestation and that only four sprays were applied, the control given by the better spray schedules is reasonably good. The relatively inadequate degree of commercial control does not, however, prevent contrasts being made between the several spray schedules, nor does it lessen the reliability of the results.

Effect of Sprays on Calyx Entrances.

The whole of the infested fruit was examined to determine the position of larval entry. The results are summarised in Table II.

TABLE II.—THE EFFECT OF VARIOUS SPRAY SCHEDULES ON THE AMOUNT OF CALYX INFESTATION.

Schedule.	% Calyx Entrances in Infested Fruit.	Significantly Exceeds.	Number of Apples Examined.
1. White oil-nicotine sulphate calyx and cover sprays	27.50	3, 4	2,130
2. Nicotine sulphate-white oil spreader calyx and cover sprays	25.67	3, 4	2,965
3. Lead arsenate calyx and cover sprays ..	10.36	..	3,073
4. Lead arsenate calyx followed by white oil cover sprays	9.36	..	2,812
5. Potash soft soap calyx and cover sprays..	42.13	1, 2, 3, 4, 6	5,821
6. Colloidal sulphur-nicotine sulphate calyx and cover sprays	29.43	3, 4	3,606
7. Control	37.25	1, 2, 3, 4, 6	5,448
Total	..	..	25,855

Standard error = 2·53 Significant difference = 7·31.

F for treatments = 24·03 which is highly significant (P. < ·01).

Those schedules which included a calyx spray of lead arsenate (Schedules 3 and 4) have, by a wide margin, produced the smallest amount of calyx-infested fruit. Every other treatment is significantly inferior to these two in this respect. This indicates that the arsenical calyx spray provides a much greater degree of protection against infestation through the calyx than the other treatments, and should not therefore be dispensed with in the codling moth spray programme.

It is also evident that Schedules 1, 2, and 6 have exercised some control over the number of larvae gaining entrance through the calyx, though markedly less than that given by Schedules 3 and 4, which included a lead arsenate calyx spray. This fact indicates that if a lead arsenate calyx spray had been employed in Schedules 1, 2, and 6, better results would have been obtained. The evidence suggests, therefore, that nicotine sulphate plus white oil may be more effective as a cover spray than either lead arsenate or white oil used alone.

Wind-fallen Fruit.

The amount of codling moth infestation in the wind-fallen fruit, as recorded to January 11, is shown in Table III.

These figures reflect the relative efficiency of the various spray treatments up to January 11. The greatest number of fallen fruit occurred on those plots in which infestation was highest, but an average of only 32 per cent. of the wind-fallen fruit was infested.

Foliage Injury Due to Arsenical Sprays.

Scorching of the foliage occurred on a number of the experimental plots, and there can be no doubt that this was due, directly or indirectly, to the lead arsenate sprays, for leaf injury appeared only on trees receiving such treatment. The injury must interfere with the efficiency of the foliage, and doubtless has a harmful influence on the vigour of the trees.

OBSERVATIONS ON CODLING MOTH ACTIVITY 1937-38 SEASON.

The activity of the moth, and the cocooning of larvæ, are shown in Plate 76, which is based on bi-weekly records from forty lure traps and twenty-four bands, and on daily temperature records. The records of moths trapped in lures demonstrate that the total period of activity extended over almost six months, from 9th October, 1937, to 25th March, 1938. The moths appeared in a series of four or five waves indicated by peaks during this period. These waves were associated with two broods of the insect, a numerous spring brood, which appeared in two waves in October and November and a summer brood which appeared in two and a doubtful third wave in January, February, and early March. Very few moths were trapped in the intervening eight weeks between these two broods. The main appearance of the spring brood extended from 13th October to 20th November, a period of five weeks, whereas the second brood appeared from 11th January to 18th March, a period of approximately nine weeks.

TABLE III.—CODLING MOTH INFESTATION IN WINDFALLEN FRUIT.

Schedule.	Uninfested Fruit.	Infested Fruit.			Total Fruit.
		Calyx.	Side.	Total.	
	%	%	%	%	
1. White oil-nicotine sulphate calyx and cover sprays	81	4	15	19	676
2. Nicotine sulphate-white oil spreader calyx and cover sprays	75	8	17	25	753
3. Lead arsenate calyx and cover sprays	86	1	13	14	1,033
4. Lead arsenate calyx followed by white oil cover sprays	82	1	17	18	901
5. Potash soft soap calyx and cover sprays	42	26	32	58	1,372
6. Colloidal sulphur-nicotine sulphate calyx and cover sprays	62	9	29	38	793
7. Control	55	19	26	45	1,479

S.E. for calyx entrances only = 2·5 Significant difference 7·2.

The temperature graph (Plate 76) indicates some correlation between the first two peaks of activity and rises in temperature, but in subsequent emergencies there was apparently little or no relation between temperature conditions and moth activity.

Larvæ descended the trunk of the trees for cocooning from early December to the close of the season. The larval progeny of the spring brood were full grown by the second week of December and descended to the bands during the remainder of that month. The great majority of these larvæ completed their development later in the season and gave rise to the peaks of moth activity shown in January and February. A few remained in the larval stage for over-wintering.

THE TIMING OF SPRAY APPLICATIONS.

As adult moths appear in a series of relatively well-defined waves during the season, egg-laying probably takes place more actively at some periods than at others. Spraying should therefore follow shortly after an observed peak of moth activity if cover sprays are to give the best results. In the experimental orchard where these observations were made, spray treatments were obviously necessary at certain times in October and November. From the first week in December to about mid-January, spray applications could perhaps have been omitted owing to the inactivity of the moth. Further sprays were required about mid-January and mid-February to minimise infestation of the fruit by the offspring of moths that emerged during these two months.

In actual practice the timing of sprays according to moth activity would necessarily be based on the consideration of several factors. Careful and regular observations must be made on the numbers of moths caught in the traps. The lures must not be allowed to lose their attractiveness through failure to renew the materials regularly. Efficient attractants must be employed. Vinegar and molasses were used in this year's work, but other lure materials such as unfermented apple juice, apple cider, golden syrup, and wine are utilized elsewhere with better results (Anon., 1938). During the 1937-38 season a molasses solution (1 in 12) and vinegar (at the same strength) in separate but attached jars caught almost three times as many moths as either of these two materials employed separately in spaced traps. A minimum number of 15 lure traps should be satisfactory for obtaining data on moth activity in any one orchard. The containers should hold about 1½ pints of liquid, should be deep rather than shallow and preferably with straight sides. Two-pound glass jars or fruit preserving cans are suitable. They should be hung in a shady position to minimise evaporation and must be examined twice weekly, e.g., Mondays and Thursdays, to record the number of codling moths caught. All moths should be removed from the traps at each routine examination.

When the number of moths caught indicates the existence of a peak in codling moth activity, consideration must be given to early spraying. When moths emerge, a period of about two to five days elapses before egg-laying begins, and a further period of from six to twelve days elapses before the eggs hatch. These periods vary according to the time of the season and with weather conditions; they are generally longer in spring than in summer, and longer also under cool than warm weather conditions. Furthermore, egg-laying is retarded and possibly suspended in cold, wet, or windy weather when the temperature is about 60 degrees

F. or below. Under normal conditions cover sprays applied during a period extending from about the fifth day to about the twelfth day after a recorded peak of moth activity in the orchard should therefore be more effective than sprays timed by any other consideration.

Because they are primarily ovicides, non-arsenical cover sprays, such as white oil and white oil plus nicotine sulphate, especially require more accurate timing. Even with lead arsenate, a stomach poison, the same timing procedure should give the maximum protection at a time when newly-hatched larvæ are seeking access into the fruit.

The maintenance of an adequate number of lure traps in the orchard and the proper recording of the insects caught should assist apple and pear growers in their codling moth control programme. Sprays applied in conformity with the data obtained should prove very effective, and unnecessary sprays can be omitted from the schedule without prejudice to the crop and with a saving in costs.

GENERAL DISCUSSION.

A lead arsenate calyx spray followed by white oil-nicotine sulphate cover sprays has previously (Jarvis, 1937) given very good control of codling moth. In 1937-38, a schedule comprising white oil-nicotine sulphate in all sprays gave control equal to that obtained from a wholly lead arsenate schedule. An analysis of the data further showed that lead arsenate is more effective in preventing calyx entrances than any other spray used in the experiment. There can therefore be no doubt that a schedule in which lead arsenate is applied as a calyx spray and white oil-nicotine sulphate in the several cover sprays will give at least equal, and probably better, results than a wholly lead arsenate schedule in the Stanthorpe district.

Although this cover spray (1¼ gallons white oil; 1 pint nicotine sulphate; 80 gallons water) is admittedly expensive compared with lead arsenate, the results obtained with Schedule 2 (1 quart white oil; 1 pint nicotine sulphate; 80 gallons water in all sprays) indicate that the amount of white oil in the former might be reduced considerably without any proportional loss of efficiency. This possibility will be further investigated in the coming season.

A cover spray which contains white oil and nicotine sulphate should prove of considerable incidental value in controlling apple leafhoppers, red mites, scale insects, woolly aphis, and possibly fruit fly.

A schedule in which a lead arsenate calyx spray was followed by cover sprays of white oil alone proved as effective for the control of codling moth as a wholly lead arsenate schedule. This result is in line with investigations in Southern States, and such a schedule should give good results in the Stanthorpe district.

Both white oil-nicotine sulphate and white oil cover sprays should obviate any arsenical residues on the mature fruit. Both possess ovicidal properties. Nicotine sulphate is also known to be toxic to moths present in the trees.

The lure trap records indicate that codling moth infestation is associated with peaks of activity of the moth. The occurrence of well-marked peaks of activity in the spring of 1937, followed by a period of inactivity, suggests that the correct timing of cover spray applications should give the most satisfactory results and eliminate unnecessary applications when the pest is inactive. The activity of the moth may

vary from season to season, and the period of eight weeks' inactivity in 1937-38 may be unusually long, as peaks of moth activity are determined by climatic and other factors during any one year. The times of spray application in one season might therefore be quite different from those in any other season.

Recommendations.

The available information warrants the following recommendations to apple and pear growers for the control of codling moth. A calyx spray consisting of 2½ lb. of lead arsenate powder (or 5 lb. paste) in 80 gallons of water (plus spreader) is essential. This spray should be aplied after petal fall and at a stage when most of the calyces have begun to close. It is designed to prevent the entry of the newly-hatched larvæ through the calyx, and, properly applied, should be efficacious in this respect for the greater part of the season.

The calyx spray should be followed at appropriate times by one or other of the cover sprays shown to be efficient in the experimental programme, viz.:—

1. White oil 1⅓ gallons, plus nicotine sulphate 1 pint, in 80 gallons of water.
2. White oil 1 gallon in 60 gallons of water.

Alternatively, lead arsenate could be used for both the calyx and the first cover sprays, one or other of the above non-arsenical cover sprays being used subsequently.

The effective use of any of the cover sprays depends primarily on the correct timing of spray applications. Orchardists will find the timing problem simplified if they maintain a series of lure traps in the orchard. Provided that conditions were favourable for egg-laying during a peak of moth activity, cover sprays should be applied not earlier than the fifth day, and seldom later than the twelfth day after the recorded peak. Growers should consult the nearest officer of the Department of Agriculture and Stock if they are in doubt as to the timing of any particular spray.

SUMMARY.

1. The 1937-38 programme of work on codling moth was designed to ascertain the relative efficiency of certain spray schedules which may obviate the accumulation of arsenical residues on mature fruit, and to investigate methods of timing sprays most effectively.

2. The experimental methods are described.

3. An orchard spraying trial showed that three spray schedules were just as effective as a lead arsenate schedule in controlling the moth. Two of these schedules embodied a white oil and nicotine sulphate spray both in calyx and cover sprays, and in the third a lead arsenate calyx spray was followed by white oil cover sprays. A combined spray of colloidal sulphur plus nicotine sulphate and also a potash soft soap spray did not significantly reduce the amount of infested fruit.

4. Schedules in which sprays other than lead arsenate were applied as the calyx sprays resulted in a marked increase in calyx penetration by codling moth larvæ. It is thus inadvisable to omit a lead arsenate calyx spray from any schedule or to substitute a contact insecticide for a stomach poison in the calyx spray. While less effective than lead

arsenate as a calyx spray, nicotine sulphate plus white oil may be more effective as a cover spray than either lead arsenate or white oil alone.

5. Observations on adult moth activity, as shown by lure traps, indicated that during a period of six months, extending from 9th October to 25th March, the moths appeared in a series of four or five waves. Spring brood activity was very marked in October and November, and was followed by an inactive period of about eight weeks. Second brood activity occurred during January, February, and March.

6. The fact that the moths appear in waves indicates that there are some periods when egg-laying is greater than at others. Cover sprays may therefore be employed more effectively if applied in accordance with moth activity. The factors on which the timing of sprays is based are discussed.

7. As a result of the season's work, alternative spray schedules for codling moth control in the Stanthorpe district are suggested. A lead arsenate calyx spray forms an essential part of the spray programme, but cover sprays consisting of white oil, with or without nicotine sulphate, are suggested as alternatives to lead arsenate.

Acknowledgments.

The statistical analyses given in this report were carried out by Miss Barbara Shield, M.A., Assistant to Research Officer. Mr. R. B. Middleton, The Summit, made available the experimental trees and provided the necessary facilities for spraying, &c. The Deciduous Sectional Group Committee of the Committee of Direction of Fruit Marketing bore portion of the loss due to codling moth infestation on the control trees required for experimental purposes. Mr. J. L. Groom, Assistant to Research Officer, gave considerable assistance in the field during the harvesting of the fruit.

The collaboration and interest of the foregoing have been particularly helpful.

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The Control of Banana Rust Thrips.

N. E. H. CALDWELL, B.Sc.Agr., Assistant Research Officer.

(*Continued from p.* 163, *Part* 2, *Vol. L.—Aug.*, 1938.)

VI. DISTRIBUTION.

(1) Distribution of the Pest in Queensland.

A KNOWLEDGE of the distribution of the banana rust thrips within the State is relevant to local quarantine measures controlling the movement of planting material. For quarantine and other purposes the banana-growing region south of Rockhampton is divided into a number of loosely defined districts, the boundaries of which are altered from time to time to suit changing conditions. Each district is in charge of an Agent of the Banana Industry Protection Board, who, of course, becomes thoroughly acquainted with every plantation under his supervision. An exact detailed survey of pest incidence was not an essential part of the present investigations, and the distribution of the pest will, therefore, only be sketched on fairly broad lines.

Most of the banana-growing localities in the coastal area north of Gympie (Plate 77) are infested with thrips. In 1935 infestations were observed at Cairns, Rollingstone, Magnetic Island, Ayr, Bowen, and Rockhampton. Just north and south of Cairns are areas known for many years to be amongst the worst affected in the State. The pest is known to occur on the Atherton Tableland (Smith, 1935), though no commercial rust has resulted. In several of the somewhat scattered banana-growing localities between Townsville and Rockhampton the insect has attained pest proportions, e.g. Mackay (1916-17). South of Rockhampton to Gympie are numerous small centres of banana production. Some have suffered severe damage from rust, e.g., Takura-Pialba (1916-1917), reported by Tryon (1925), while in others *S. signipennis* is known to occur but in insufficient numbers to cause appreciable commerical damage. In the remainder there seems to be good reason for supposing that the pest species may not occur. Two such areas, each with only a small acreage, are situated at Biggenden and Gayndah, both of which are out of the recognised banana-growing belt. In the coastal region, however, it is reported (Hancock, 1936) that sundry localities are free from rust.

The bulk of the crop sold outside Queensland is grown south of Gympie, and a knowledge of the exact distribution of the banana rust thrips is particularly important as a guide to the Banana Industry Protection Board in determining its policy concerning the movement of planting material.

The Gympie district itself was the centre of the first outbreak of thrips in southern Queensland and, as far as is known, the whole district is affected.

South of Gympie (Plate 78) the distribution of the pest is practically continuous through Traveston, Cooran, and Pomona to Cooroy, though some isolated localities have suffered very little loss. Along the Mary Valley line, Gympie to Brooloo, rust has often been severe.

In the Eumundi-Yandina district, thrips have been present for some time in sundry localities but so far no serious developments have taken place.

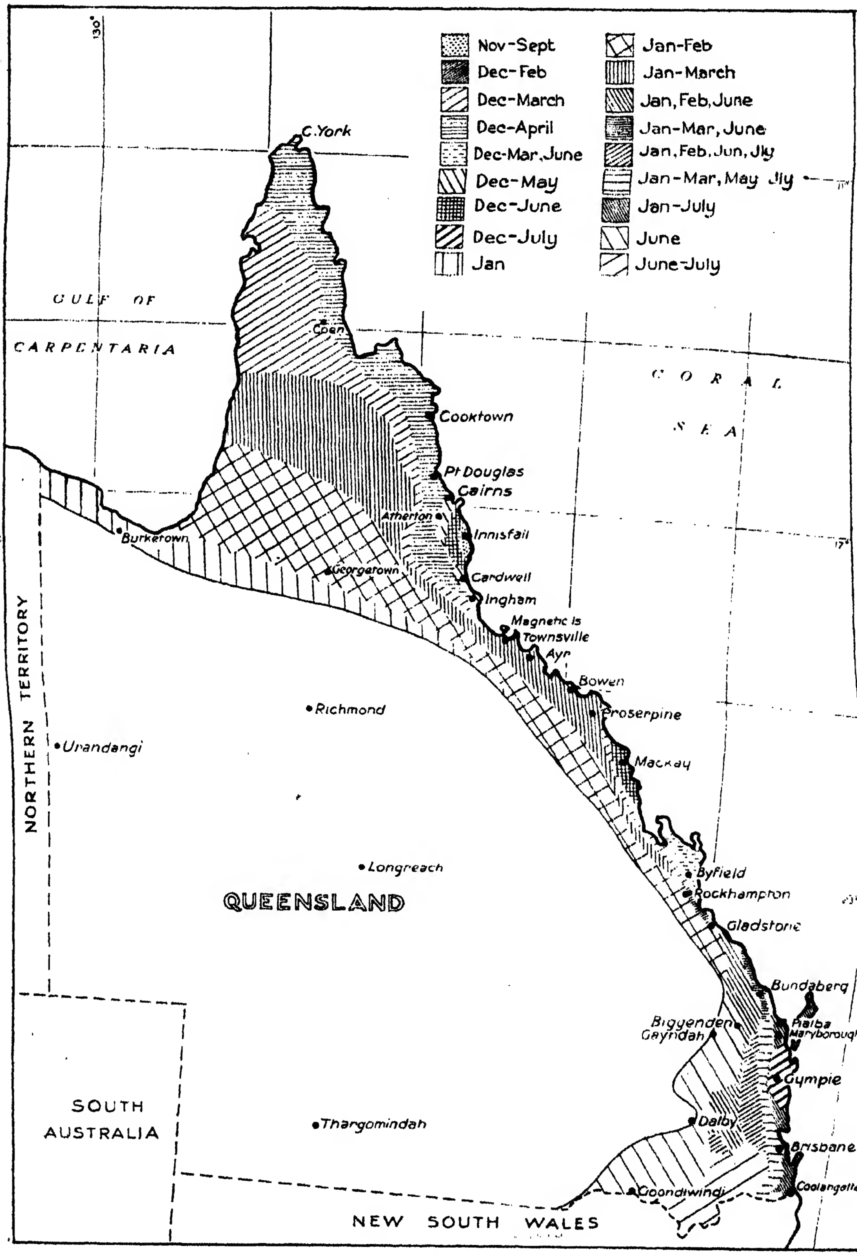


Plate 77.

Queensland, showing areas in which rainfall exceeds evaporation for stated periods as determined by the saturation deficit. Bananas require adequate moisture and thrive best when rainfall exceeds evaporation for the greater part of the year.

(After Davidson.)

From Nambour to Caboolture has always been considered a clean belt, but the recent discovery of *S. signipennis* on citrus at Nambour and on both citrus and bananas at Palmwoods renders suspect a portion of this area. On grapefruit at Palmwoods a fairly large population built up during the 1935-36 summer and seriously blemished the fruit. Commercial rust in bananas, if it did occur, must have been rare for no official reports have been made on the subject by officers closely associated with this area.

In the Upper Caboolture district a slight amount of commercial damage was recorded in the 1933-34 summer but only on isolated plantations. Slightly blemished fruit has been observed from localities between Caboolture and Woodford (on the Kilcoy line) but the insect could not be found on the plantations.

The banana rust thrips is of little or no importance in the Brisbane and near-Brisbane districts. Thrips are not known in the Dayboro' district. A very light infestation was detected at Brookfield but no commercial damage has resulted. Wynnum-Manly-Cleveland-Redland Bay areas are probably free from the pest.

South of Brisbane to the New South Wales border is a region of irregular distribution.

Beenleigh is a centre of severe, though restricted infestation. One plantation has suffered fairly acute commercial damage in recent years, while the insect has been detected on sundry other plantations at Cedar Pocket and Mount Cotton. In the 1936-37 seasons, commercial rust developed on isolated plantations at Ormeau and Upper Coomera. Nerang, near Southport, is another centre of infestation, and severe damage occurred several years ago on some plantations at Mount Nathan and Callagraba. The pest is known to occur in certain other localities, e.g., Upper Mudgeeraba.

In the 1936-37 summer a fairly severe infestation was located on one plantation in the Tallebudgera Valley, previously regarded as a clean area. Other plantations in the valley are probably harbouring the pest. In the Currumbin Valley, one plantation developed sufficient commercial rust in 1933-34 to cause some concern for the future but rust incidence has since declined in severity. Thrips have been located in several other plantations in the valley.

Tryon (1925) recorded *S. signipennis* from the Tweed Valley in 1920 and 1924. It is not clear to what portion of Queensland territory this record applies but in sundry small areas between the Currumbin Valley and the border the presence of either thrips or rust has not been observed in recent years.

The ever-changing importance of the main centres of production and the fluctuations of the insect population constantly modify the significance of the different foci of infestation. For instance, in 1930-32, owing to severe infestation at Callagraba, Nerang, and Mount Nathan, thrips were a serious menace in the Southport district. Since then practically all the affected plantations have been eradicated, new outbreaks have not occurred, and rust is not at present of any importance in the district. Similarly, in 1933-34, the situation on one plantation in the Currumbin Valley was potentially serious but the thrips population has since declined to comparatively small numbers. Although the plantation is still extant and bananas are grown extensively in the

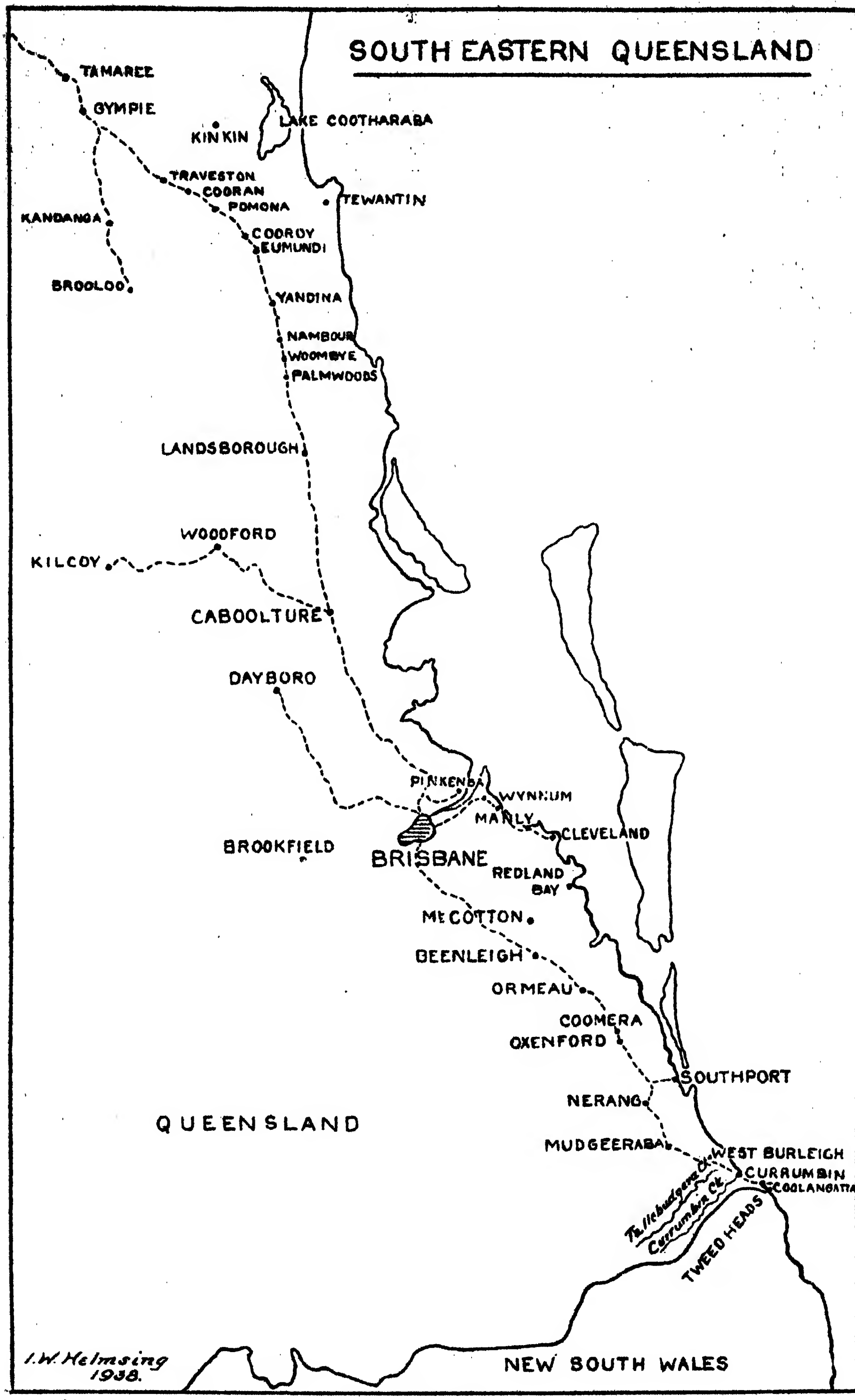


Plate 78.

South-Eastern Queensland, showing towns and localities mentioned in the text.

vicinity, rust is not at present viewed seriously. In 1933-35 a number of control experiments were carried out at Cootharaba, near Pomona. Banana growing has now practically ceased in this locality. The position may, of course, be completely changed in all these, and other districts, in the next few years.

(2) Factors Governing Distribution.

As the foregoing survey shows, the pest is literally distributed from one end of Queensland to the other along the agriculturally-developed areas of the coastal belt. In this range of 1,000 miles or so, climatic conditions vary considerably (Plates 77 and 79), and it will be seen that the banana rust thrips is distributed throughout wet to fairly dry tropical and sub-tropical environments. Even in the far north, however, there are definite seasons, a hot wet summer alternating with a marked winter period characterised by relatively low temperatures and rainfall. It must be concluded, therefore, that climatic conditions prevailing in coastal Queensland nowhere preclude the establishment of the pest in banana plantations.

The influence, if any, of other factors on thrips distribution is similarly ill-defined. Soil factors appear to be unimportant. The soils of the Queensland coastal belt present an almost infinite variety of types and bananas are cultivated, more or less successfully, on practically every one of them. Severe thrips infestation has been observed on almost every type of soil on which the crop is grown. Topographic features are undoubtedly important in determining the intensity of infestation but their influence on thrips distribution in an absolute sense either directly or indirectly by affecting local climatic conditions, is problematical. The physical characteristics of the banana plant, though modified to a considerable degree by the environment, have no apparent effect on the distribution of *S. signipennis*.

VII. POPULATION STUDIES.

(1) General.

Although *S. signipennis* has been recognised as a pest for practically the whole of the present century, very little attention has previously been paid to the question of population density and fluctuation. The following discussion is based on observations in southern Queensland over a period of four years—1933-37—and in the north during one short visit at the end of 1935. The value of these observations is lessened somewhat by the fact that during this period the thrips epidemic was on the wane, after a peak apparently attained during the summers of 1931-32 and 1932-33. Deductions from them are therefore tentative, particularly as, in the absence of exact population counts, subjective impressions had to be relied upon to a great extent.

In this discussion of climatic factors only the general conditions for the district can be considered. Population studies aiming at defining the probable climatic limits of distribution of the pest, either absolutely or as a pest, were not attempted. They would be of little value in Queensland where the pest is known to be potentially dangerous throughout the whole banana-growing area of the State. Similarly, detailed ecological studies designed to facilitate the prediction of rust incidence were not undertaken. They would have been of little practical importance, for the increase of the pest population in each season is a gradual

process taking place in each plantation. It can therefore be kept under observation by the grower and the point at which control measures must be initiated can be quite easily determined. The position is thus very different from that in which a pest invades an area in plague form (Evans, 1932; Bailey, 1933, &c.).

(2) Population Density and the Normal Seasonal Fluctuation.

The thrips population fluctuates between a low level in the winter and a peak in the summer, the density of the population at the peak largely determining the incidence of commercial rust. There are other predisposing factors but, unless the summer population attains a certain high level, commercial rust will not result. The winter population often becomes very small, so small, in fact, that, during a winter separating two summers of fairly severe rust incidence, it is sometimes difficult to locate any insects at all. On the other hand, the thrips sometimes persist through the winter in quite appreciable numbers, especially on small suckers and low down on larger pseudostems. Plantations with a large over-wintering population during the decline of an epidemic do not necessarily suffer from severe rust in the following summer. The winter surviving population cannot, therefore, be the only factor determining the incidence of the insect in pest proportions, though it is probably a contributory one.

Peculiarly enough, the pest population in the far north of the State fluctuates from summer to winter to about the same degree as in the south. Smith (1935) states that in the winter the population in the north becomes very small though the level attained may not be as low as in the south. In a normal summer the insects are probably more numerous than in the south for, at the end of November, 1935, the population was far larger than ever experienced in the south at the same season. The severity of rust development is apparently greater in the north. Since the time taken by the fruit to reach maturity, and thus the time during which it is exposed to the attack of the insects, is appreciably less under tropical than subtropical conditions, this greater rust development must be due to a proportionately greater insect population. Therefore, assuming a somewhat higher winter population level in the tropics, the amplitude of the normal seasonal fluctuation in pest numbers appears to be about the same in all parts of the State.

The severity of rust incidence in any season must depend largely on the rate at which pest proportions are attained. Rust is a cumulative effect of thrips activity which reaches a peak in mid-summer and declines with the advent of cool weather. Therefore, the greater the rate of population growth in the spring the earlier will the insect reach pest proportions. Because a large proportion of the bunches in any one year are thrown in spring and early summer, most bunches will be subjected to attack during the whole period of growth and suffer the maximum amount of injury. In epidemic years, the population apparently reaches a high level early in the season as well as a high ultimate peak.

The date at which the pest becomes important in the plantation varies from season to season. In the 1932-33 summer, as far as could be gathered from growers affected, there was considerable development of commercial rust on some plantations by the end of November. In 1933-34 little commercial rust was present before the middle of December and control experiments initiated at the end of October were, for the first month at least, wasted effort. In 1934-35 infestation was such that

control experiments could not profitably be undertaken before January. In 1935-36 it was difficult to select plantations at the end of January in which thrips incidence warranted their use as experimental plots. In 1936-37 it was the end of January before a decision could be made as to whether experimental work on control was justified.

In each season, severe commercial rust developed on some plantations. Though undoubtedly less than would be experienced during the peak of an epidemic, the decreased importance of the pest in each plantation was, in great part, due to the smaller amount of fruit affected with the maximum amount of injury.

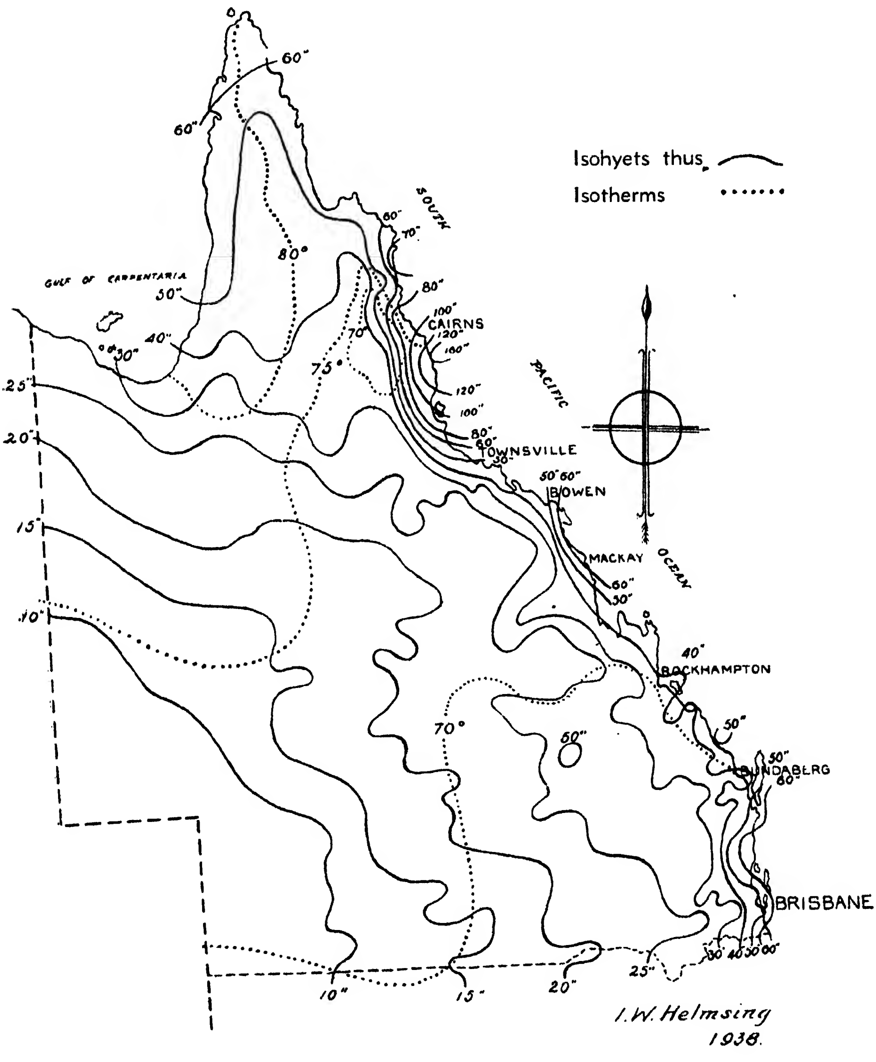


Plate 79.

Queensland, showing isohyets and isotherms. Note that the intensity of the rainfall is greatest along the coastline though a relatively dry belt occurs south of Townsville.

(3) Factors Influencing Population Density and Fluctuation.

(*a*) *Topography.*—As survey work proceeded it became evident that, at least under the conditions pertaining to 1933-37, the banana rust thrips never attained serious proportions in certain environments. Such environments were all classed as "cold" from the cultural point of view and were of three main types, viz., (i.) southerly slopes, (ii.) situations other than southerly slopes unduly exposed to cold winds, and (iii.) situations approaching or at frost level in the winter. Observations on thrips population and rust incidence for an extended period on several plantations showed distinct differences between plantations of the above types and others preferable for purely cultural reasons.

In arriving at general conclusions from field observations due consideration was given to the history of the plantations, particularly the source of planting material which would probably determine the status of the initial infestation, and to cultural treatments which might influence population trends. In severe epidemic years, of course, the factors in an environment inimical to the pest either cease to be effective or are overshadowed by others favourable to it. Nevertheless, there can be no doubt that the colder the situation the less liable is a plantation to severe thrips infestation. Unfortunately, in southern Queensland, such situations are also definitely unfavourable for banana culture.

(*b*) *Soil Type.*—No evidence has been adduced that soil type or conditions play any significant part in determining population densities. Heavy infestations have been observed in banana plantations on most soil types in coastal areas. The variability of the rainfall in the several banana-growing districts indicates that soil moisture conditions are not of paramount importance.

(*c*) *Climate.*—In the absence of controlled experiments of an ecological nature, little can be said about the exact effect of the climatic elements on populations of the banana rust thrips.

Temperature is probably the most important single climatic factor influencing population density. In the first place, the topographical influences, already outlined, seem merely to reflect temperature variations. Secondly, there is the purely negative evidence that rainfall and humidity do not seem to occupy major roles.

The protection given to both bunch and pseudostem by the foliage of the banana plant precludes the possibility of heavy mortality amongst insects on the plant as a result of the mechanical action of rain. Excessive rainfall does not, obviously, have an adverse effect on the banana rust thrips as some of the worst affected districts in the State are located in the wet belt of North Queensland. That low rainfall is apparently not a major factor dominating population density is shown by experiences at Rollingstone, near Townsville, in North Queensland. Observations at the end of November, 1935, showed that the thrips population was sufficiently large at that time of the year to have caused a considerable amount of commercial rust later in the season, judging from southern Queensland standards, though it was admittedly smaller than further north in the vicinity of Cairns. The rainfall at this point from January to November of 1935 was less than 15 inches, and no irrigation was practised to remedy soil moisture deficiencies. It is improbable that, in a plant like the banana, the water balance would be upset sufficiently, even under drought conditions, to affect eggs embedded in the tissue.

Similarly, humidity seems to be of little importance in regulating population density.

(*d*) *Age of the Plantation.*—It is a widely-held belief in all parts of the State that rust incidence decreases with increasing age of the plantation and that fruit of the first cut* is the worst affected. Observations during the last four years have tended to confirm the accuracy of this belief without in any way revealing the reason for the phenomenon.

Two examples, subject to close observation over an extended period, will illustrate the normal position during the period 1933-37.

Example 1.—A plantation, very uniform in natural environmental characters and in cultural treatment, consisted of three sections from which, during the 1933-34 summer, the first, second, and third cuts respectively were taken. The planting material for the second and third sections was taken from the existing areas. During the 1932-33 season the two older patches had been severely affected with rust though the growers had not observed any difference between the two sections. In the 1933-34 season the youngest section, then on its first cut, suffered considerably from rust but on the other two sections there was little loss. Subsequently thrips infestation was comparatively light, and it was not possible to gauge any significant difference between the various sections.

Example 2.—Two plantations in one locality occupied very similar situations about three-quarters of a mile apart. In the 1932-33 season the older one, then on the first cut, was very severely affected with rust. In 1933-34 the rust was fairly bad, but, in the 1934-35 summer, by which time the cultural requirements of the plantation were seriously neglected, there was practically no commercial damage. The younger plantation was on the first cut in 1933-34 and the fruit was very severely rusted. In 1934-35, when this area also had been neglected, rust development was again very severe, though rather less than in the previous year.

In this instance, the severe rust during the 1934-35 season in the second plantation indicates that the comparatively light rust incidence on the first plantation must have been due to conditions peculiar to that plantation and not to any factor operating over the whole district. The possibility of a differential effect of cultural measures was negligible as both areas were in a similiar state of neglect during the summer of 1934-35.

No old plantation, i.e., on the third or subsequent cuts observed during the course of the investigations suffered so severely from rust as the average bad plantation during the same season. At that time the oldest plantations in localities of severe rust incidence were on the fourth cut.

Older plants, normally less vigorous in growth, tend to throw small bunches which on account of their more open character, are morphologically less favourable for rust development. At the same time, the passage of such bunches through the throat of the plant is normally less rapid, and a proportionately larger initial thrips population could well be acquired.

* "Cut" is a term used by growers to denote the various harvests of fruit. Thus the "first cut" comprises the bunches produced by the plant crop; the "second cut," those produced by the first suckers allowed to reach maturity, i.e., the first ratoon bunches constitute the "second cut," and so on.

As far as could be ascertained the phenomenon of declining rust incidence in older plants is due to a diminished thrips population and not to any variation in the host plant's reaction. In no case has the amount of rust development been incompatible with the observed population density.

It might be anticipated that the absolute population density for a fixed area would increase with increasing plantation age. The normal practice in banana culture, at least in the rust susceptible areas, is to increase the number of plants per stool from year to year. Thus, for example, in the first cut there will be one bunch per stool, in the second cut two or three, and in the third cut three or four. With increasing age there is thus a corresponding increase in the extent of the presumably favourable environment for the insect within the plantation. There is no apparent reason why the over-wintering population should not increase proportionately and keep pace with the extension of breeding area, thus maintaining the same population density per plant.

In the absence of parasites or predators of any kind, which would act directly on the insect population, it must be assumed that variations in the population within a plantation must be determined by the condition of the plant itself or by the environmental modifications produced by the plant. It has been suggested that the increased number of plants in an old plantation would alter the environment by the additional shading. This, however does not seem very plausible for (1) any temperature changes would only be very slight, (2) closely-planted, luxuriant plantations do develop severe rust on their first cut, (3) plantations subjected to a rigorous suckering programme fail to develop rust more severely than those in which free sucker growth is permitted, and (4) since growth during second and subsequent years, under present systems of culture, is usually less vigorous than in the first year, the increased shading may not be pronounced. Alternatively, it may be postulated that, on account of some structural or physiological modification, the plants in old stools provide a less favourable environment for the insect and thus keep the population per plant at a relatively low level. This hypothesis has not yet been investigated.

The foregoing discussion indicates that the effect of the age of the plantation on the banana rust thrips population still requires an adequate explanation. At present it must not be implied that (1) old plantations will not be affected with severe rust, or (2) young areas will always be worse affected than older ones in the same locality. Various other important factors, such as topography, source of planting material, phase of the epidemic, &c., must obviously have a considerable effect which may quite obscure the influence of age. The only definite statement which can be made is that, during the declining phase of an epidemic, the greater the age of the plantation, the less the tendency to develop severe rust.

(*e*) *Plantation Management.*—The type and normal treatment of the planting material used in establishing a plantation must be considered under this heading. Suckers* comprise the bulk of the planting material used in southern Queensland at the present time. In preparing suckers for planting about 6 in. to 1 ft. of the pseudostem usually remains after removing the top. Such suckers, when taken from a thrips-infested plantation, can harbour a considerable number of insects. More severe sucker treatment, entailing the reduction of the pseudostem to 3 in. or

* "Suckers" are offshoots from the corm of a parent plant.

less in length and the complete removal of the outside layers of leaf-sheaths, must considerably reduce the thrips population of the newly-established plantation. The use of "butts"* and "bits,"† provided they have been carefully cleaned of all adhering soil, must still further reduce the initial population. In fact, this type of planting material appears to offer the best chance of obtaining clean, or reasonably clean, plants from an infested plantation.

In the established plantation, cultural conditions could quite conceivably have an effect on the insect population, chiefly because the pupal stage is passed in the ground. It is a common belief that severe rust is never experienced on a neglected plantation which is overgrown with weeds. Such plantations will be at least on the second cut, for most growers will suppress weed growth to a reasonable extent at least until the first thrown bunches are harvested. Many of the plantations on which the thrips population has declined during recent years have been more or less neglected. However, one of the 1934-35 experimental plots demonstrated that neglect is not necessarily followed by a diminution in rust incidence. In the previous summer this plantation, then on the first cut, developed very severe rust. From the middle of 1934 onwards the bananas were completely neglected by the grower, with the result that, throughout the 1934-35 rust season, the whole area was covered by dense weed growth of mixed character up to 5 feet high in parts. In this season severe rust was again in evidence, perhaps rather less than in the preceding year but still representative of an epidemic peak.

Weed growth could influence the pest position by its effect on the general environment, particularly the soil, and by diverting part of the insect population to such of the weeds as could act as alternate hosts to one or more feeding stages. The possible influence of alternate hosts seems to be discounted by the fact that, as previously stated, none of those plants which normally comprise the greater part of the weed growth in banana plantations in southern Queensland have been found to harbour the pest.

As regards the soil, weed growth would be expected to reduce materially both soil erosion and compaction, two factors usually found to cause a high mortality amongst pupæ and emerging adults of many species of Thysanoptera (*cf.* Bailey, 1933; Harris, Drake and Tate, 1936). This effect would operate particularly during the periods of heavy rainfall characteristic of Queensland summers. In normal seasons, weed growth should not seriously deplete soil moisture, which, in any case, is probably of little importance in regulating thrips populations. In providing additional shade weed growth must influence soil temperatures. The effect of this on the insect population is not clear, though the prevention of excessive temperatures in soil not otherwise shaded by bananas should scarcely be harmful to the soil-frequenting stages of the insect.

The available evidence suggests that the incidence of rust was influenced more by the wane of the epidemic and the age of the plantation that by the weed growth incidental to neglect.

Another State-wide belief is that suppression of weed growth by arsenical sprays, in preference to hoe chipping, tends to decrease rust

* "Butts" are the underground corms of the mature plants.

† "Bits" are sections of a "butt" containing one or more eyes.

incidence, presumably by reducing the insect population. Limited opportunities were afforded for making observations on this point and controlled experiments were not possible. Sundry plantations, on which weed spraying was the normal practice and on which severe rust had never developed, have been examined, but in all cases it was quite clear that other factors, such as location, could have been responsible for the phenomenon. As evidence in favour of weed spraying for the control of rust, the examples were valueless. Other plantations, on which a certain amount of spraying had been done, developed severe rust, but it must be admitted that the number of sprayings may have been too few to produce results. The arsenical sprays would probably act, if at all, through their effect on the pupal stage in the ground, and considering the details of the insect's life history, it is highly improbable that the number of sprays usually given would materially reduce the population. Nevertheless, the question must still be considered an open one.

The subject discussed in the preceding paragraphs is important in view of the probable development of cover cropping in the banana lands of coastal Queensland and will require consideration when cover crop possibilities are being investigated. At present the probable effect of any cover crop on thrips activity cannot be indicated.

The fairly common practice of trashing may influence population density. This operation involves the removal of all dead and dying leaves. Dying leaves are usually severed at their junction with the pseudostem, while the sheaths of dead leaves are more often stripped right down the pseudostem and cut off towards the base of the plant. Trashing is usually carried out in the autumn, though it may with advantage be done in midsummer as a measure of control against fungous diseases of both leaves and fruit. Pseudostem colonies may be disturbed to a certain extent by the operation. Also the removal of the dead leaves, which are normally draped around the pseudostem and over any small suckers, may increase the exposure of overwintering thrips to the rigours of the cold weather. However, no evidence has been obtained to show that trashing has any significant effect on the thrips population.

The cutting up of the pseudostems after the removal of the mature bunch, as advocated for banana weevil borer control, may have a slight adverse effect on the thrips population in the plantation, though insufficient to have any practical value in controlling the pest.

Similarly, the removal of the "flower" bud below the bottom hand of fruit after the bunch has fully opened, a practice not generally followed in Queensland, may result in the destruction of a few insects. However, as the number of banana rust thrips in this part of the plant is very small, especially during the early stages of bunch development, there can be no significant effect on the pest population.

VIII. EPIDEMICS.

(1) The History of Epidemics in Queensland.

Little can be said of serious outbreaks of the banana rust thrips prior to the last fifteen years, except that they did not occur in the southern part of the State. There are numerous references to the pest, but the information gives no indication of the relative severity of rust

incidence from year to year (Tryon, 1912, &c.). Since 1924, owing to the sometimes severe losses in the more important banana-growing areas, the pest has received greater attention.

There were serious outbreaks in southern Queensland in 1923-25 and 1930-33. The latter was the more extensive and, in this case, some plantations as far south as Southport were severely affected. The extension of the infested area in the later outbreak was almost certainly due to the considerable development of banana growing south of Brisbane at the end of the decade 1920-30. Between 1925 and 1930, the pest was less numerous and, in 1927, experimental work on control was not possible on account of light infestations. Since the 1932-33 season the losses have steadily diminished in southern Queensland. While a few plantations have suffered severe damage in each season the amount of rust in many localities previously heavily infested has been of little or no commercial importance.

In the far north, it appears that the periodic fluctuations are not so marked. Admittedly there have been periods in the last fifteen years when the economic importance of the pest, and hence the amount of attention attracted to it, have been greater than at others, but these periods probably coincided with the settlement of rain forest areas in which bananas can be a profitable clearing crop. The position in the far north seems to be that infestation is great enough each year to cause fairly general commercial rust, though in some years the severity of rust incidence is greatly accentuated.

The position in the areas between Townsville and Rockhampton has not been investigated. From Rockhampton to Gympie the periodic fluctuations of the south seem to prevail.

(2) Factors Governing Epidemics.

Little can be said about the factors governing epidemics of the banana rust thrips. Nevertheless, general considerations of Thysanopterous pest outbreaks (Evans, 1932; Bailey, 1933) prompted an examination of meteorological data, especially temperature. Rainfall and mean monthly temperature records for Gympie were examined in an attempt to discover climatic factors associated with the epidemic seasons, 1922-23 to 1924-25 and 1930-31 to 1932-33.

The first series of epidemic years was characterised by mean maximum monthly temperatures up to 5 deg. higher than the average. During the second series the mean maximum summer temperatures were up to 6 deg. above the average, while for the remainder of the year they were more or less normal. The mean minimum monthly temperatures were not correspondingly high in either series of years, but at the same time they did not fall below the average in any of the epidemic seasons.

Examination of the temperature data for shorter periods within the year, such as winter, winter and spring, spring, &c., did not reveal any significant differences between epidemic and normal years.

That an epidemic may be the result of the cumulative effect of favourable temperature conditions over a long period is suggested by the fact that, though for the calendar year 1926 temperatures were considerably above the average, there is no record of severe thrips incidence in that year, or, in fact, until 1930. It is noted that the calendar years 1925 and 1927 were considerably colder than the average.

The rainfall figures showed no correlation with the intensity of thrips infestation.

IX. INJURY TO THE BANANA PLANT.

(1) Injury to Vegetative Parts.

Under plantation conditions no injury to the vegetative parts of the banana plant can be directly attributed to the banana rust thrips. The feeding of colonies on pseudostem and bunch stalk probably accentuates the characteristic reddish discolouration irregularly distributed on these parts of all Cavendish plants, irrespective of thrips distribution. It is probably the normal reaction of the plant to exposure to the sun. In any case, injury to banana tissues, no matter how slight, tends to produce a reddish discolouration.

Injury to the leaf tissues occurs only when large colonies of adults and larvæ have fed, for a more or less extended period, on young leaves, during and immediately after unfurling. This effect has been observed only under severe drought conditions and is almost certainly associated with retarded growth of the plant. Mixed colonies become established on the leaf only if ovipositing females find suitable shelter for a considerable time in the funnel leaf, the unfurled leaf not being a favoured oviposition site. In normal seasons the rate at which leaves unfold is too rapid for colony establishment to take place.

The damaged tissue of the leaf blade presents a somewhat blistered appearance, with a more or less reddish-brown discolouration. The degree of discolouration appears to depend to a certain extent on the amount of exposure to the sun, for it has been observed that the portions of the leaf first to unfold are the most intensely discoloured. On the upper surface of the leaves, discolouration tends to be more pronounced along the veins, which, in all cases examined, were much more prominent than normal, a common symptom of drought conditions. The midrib on both surfaces is usually more reddish in colour than the blade, especially in the central depression on the upper and the two lateral furrows on the lower side.

Withering and ultimate desiccation of portions of the leaf blade have been observed, but in no case has the damage been of commercial significance.

(2) Injury to the Fruit—Rust.

(*a*) *The Nature of Rust.*—The nature of banana thrips rust has been briefly defined by Girault (1925) and discussed at some length by Smith (1934). Rust is the name popularly applied to the disfiguration of the skin of the banana fruit caused by the feeding activities of *S. signipennis.* Oviposition, which takes place in the same tissue as that fed upon by the insects, apparently plays no part in producing this disfiguration (*cf.* Bailey, 1933).

On very young fruits the first trace of insect damage, which is usually due solely to adult feeding, has a water-soaked appearance and is slightly reddish-brown in colour. This is followed by a dark discolouration of slight intensity to which the term "smokiness" has been applied, after which the red colour of the typical rust makes its appearance. At first, owing to the admixture with black, the red colour is dull and confused, but it gradually replaces the former and becomes a definite full colour with a more or less glossy surface. True redness

may appear very early in the life of the bunch, but usually there is a distinct interval during which smokiness is the predominant colour. In bunches which remain attached to the plant for a considerable length of time an ochraceous or brownish colour is often found. Rust of this type is more common on bunches thrown late in the summer for, owing to the slow rate of development during the cold weather, they hang for a much longer period than the earlier-thrown fruit.

The colour change from smokiness to red is apparently due partly to the reaction of the fruit to continued feeding by the insects and partly to its advancing maturity. Thus smokiness alone is usually found only on very young bunches, except in very slight infestations when the total injury may be thus described. However, even in these cases there is usually some gradation into red. If the thrips are numerous the red colouration may make its appearance before the bracts have withered. During the summer months, rust on mature bunches will usually be entirely of the red type, though at times there may be a smoky margin to the reddened areas. Later in the season, smokiness is slightly more pronounced on mature bunches, though never plentiful, for, if very slight, it practically disappears after thrips activity has ceased and, if more intense, turns reddish as the bunch matures. The ochraceous colour is found on bunches only when rusting has been severe.

In addition to the discolouration, disruption or cracking of the skin may also occur. The cracks normally run more or less longitudinally, are irregular in spacing and may be of varying length. In the first instance, only the epidermis proper is ruptured. Later the cracks become deeper and may ultimately result in the splitting of the skin from end to end, exposing the flesh beneath.

The cracking of fruit affected with rust must be distinguished from another type of skin rupture associated with a reddening of the surface of the fruit. In this case, the cracking takes place more or less regularly in both longitudinal and transverse directions with the result that the damaged portion is divided into definite and fairly regular rectangular areas. The final appearance is thus quite distinct from thrips rust. The position of this blemish on the top side of the fruit also serves to distinguish it from true rust. The cause of this condition is unknown and, though possessing little importance, it has sometimes been confused with rust.

Cracking and splitting as a phase of rust development are the result of the injured skin being unable to keep pace with the normal growth of the fruit. The first cracks may appear, in severe rust years, when the fruit is only half mature. Cracking is usually only associated with fully developed redness, but in the case of some bunches attacked in the autumn, slight cracking may be found in conjunction with marked red and black colouration. Splitting occurs only in mature fruit and, if due solely to rust, only in association with severe blemishes.

Rust of any degree detracts from the appearance of the fruit, though moderate blemishes do not impair its eating qualities. Severe rust, however, even without splitting, may spoil the flavour, while split fruit has no market value. Commercial rust, a term used freely in the foregoing pages, is merely discolouration with or without cracking and splitting of sufficient extent and intensity to cause depreciation in the market prices of the fruit or to prevent sale.

(*b*) *Distribution on the Fruit.*—An account of the sequence of events involved in the throwing of a bunch will facilitate an understanding of the distribution of rust on the individual fruits, as well as on the bunch as a whole.

The emerging bunch while still in the vertical position is tightly compressed. The two whorls of fruit in each hand and the individual fruits in each whorl are packed closely together. The long axes of the fruits lie more or less parallel to the bunch stalk. The whole hand is held against the base of the next hand by a close-fitting bract. As the bunch is inverted, the hands open out, until the fingers are more or less at right angles to the bunch stalk. The two whorls of fruit in each hand move apart so that the fingers of one are separated from the fingers of the other; the adjacent fingers in each whorl separate, the bracts dry out and later become detached at their base, often falling from the bunch. These changes take place simultaneously within about one to four weeks from the first appearance of the bunch, depending on the time of the year and the seasonal conditions. Thus the fruits are separated long before they begin to fill out and assume a rounded shape. There appears to be a slight difference between the conditions in various parts of Queensland for Smith (1934) working in the north mentions ". . . . . . the appearance of the rounded contour which initiates the separation of the individual fingers. . . . ." In the south, as the fruits increase in size and become rounded in outline, they tend to fill up the interspaces and become once more closely appressed to each other (though not along their whole length) until in the mature bunch the fruit is very tightly packed. Thus, normally, from the point of view of the thrips population, environmental conditions on the bunch are at first excellent. Then follows a short period when the habitat may be less congenial, after which conditions for the pest steadily improve.

As previously explained the insects are chiefly confined to sheltered situations which, in the case of the banana bunch, are, for the most part, the contact surfaces between fruits; the word "contact" is used to imply close proximity as well as actual physical contact. (*Cf.* Smith, 1934). In the early stages, the bracts are appressed to the top surface of the uppermost whorl of fruit in each hand, and afford excellent shelter for the pest. Under normal circumstances in southern Queensland, the bracts do not persist long enough to allow extensive injury to the surface of adjacent fruits, and when they wither and fall, the insects move to other vantage points, usually leaving areas of merely incipient rust on the top surface of the hand.

Rust thus normally occurs on the sides of fruits which are touching or in close proximity to their neighbours. The extent of the blemishes both longitudinally and circumferentially is dependent on several factors. In mild cases the rust will be confined to a small area on the sides of the fruit near the stalk end where contact is maintained for the greatest length of time. In very severe cases practically the whole fruit may be damaged, though this is rather rare in southern Queensland even during severe epidemics. It would appear to be more common in the north.

An examination of a very rusty bunch shows that the area blemished on any fruit usually extends a considerable distance from contact or closely placed surfaces. In severe infestations, the insects spread beyond the actual shelter afforded by adjoining fingers, especially in the direction of the underside of each whorl of fruit where there is a considerable

amount of shading. The larvæ, often found out in exposed situations, also extend the area over which feeding takes place, though sometimes their numbers in these parts of the fruit are insufficient to produce more than a moderate degree of smokiness. Obviously, however, the amount of discolouration demarcates the surface area over which the insects have fed and, in severe outbreaks, this bears little relation to the area of the contact surfaces. The common impression that the insects operate only at or near contact surfaces overlooks this point. On the other hand, a great deal of injury is caused while the fruit is young and, as the damaged tissue grows to some extent with the rest of the fruit, the presumed increase in the area of actual thrips pasturage may not be very great.

In the normal opening bunch, pairs of fruits sometimes stick closely together along their whole length for a period while the rest of the fingers are well separated. The reason for this is not clear. If these fruits are parted by hand they do not return to their original positions but remain apart. These fruits provide a specially favourable environment for thrips. The young angular fruits fit very closely together and rust development on them is often both extensive and severe. This phenomenon may also explain the occurrence of severe rust on odd fruits of bunches which have been kept generally clean by the application of control measures, for insects between such fruits would be well protected from lethal agents such as dusts.

The effect of slight abnormalities in the bunch may be mentioned here. It is not unusual for some of the bracts to remain caught up in the bunch after drying, either resting on top of the hands or hanging over the distal extremities of the fruits. These provide shelter for the insects and the associated rust is often sufficiently severe to induce cracking later.

The large bract subtending the bunch may often, when dry, overlie the bunch and afford shelter for the insects. Rust may then develop away from contact surfaces between fruits. Similarly, one or more leaves may be so placed as to have the same effect. Any malformation of the bunch affecting the normal disposition of the fruits may also widen the range of suitable habitats for the insects. Generally, these aberrations are of no great importance under plantation conditions in southern Queensland.

On any one fruit all the rust development is not necessarily of the same intensity. Normally, the focus of development is that area where contact between adjacent fruit has been maintained for the longest time. Cracking will first start here and splitting will almost invariably pass through this point. The whole of the rusty zone may be comparable with this focal area but more commonly the disfiguration grades off in intensity towards the margins.

(*c*) *Distribution on the Bunch.*—It has been shown that the basal hands of the emerging bunch—which become the top hands of the inverted bunch—are the first to become infested with the banana rust thrips. They also eventually acquire the greatest population. Since rust distribution on the bunch is largely a reflection of population density, these top hands are normally the most severely affected. The fruit is seldom badly rusted right down to the bottom hand. More frequently there is a more or less regular decrease in intensity from top to bottom of the bunch. Sometimes the bottom hands may be

free of commercial rust while the top hands have reached the stage of severe cracking and even splitting.

This more or less regular gradation may be upset to a slight extent by the minor abnormalities discussed in connection with rust distribution on the individual fruits. Colonies originating from the advent of flying adults, which presumably alight by chance on any part of the bunch, may cause a discontinuous distribution of rust throughout the bunch. This type of infestation may explain the not uncommon occurrence of severely rusted patches, often involving only a few fruit, on the lower hands when the normal gradation from top to bottom would provide for comparative freedom from commercial rust in this region.

(*d*) *Development in Relation to Age of Fruit.*—The greatest development of rust undoubtedly takes place during the early stages of the life of the bunch. For the first few days, when the population is predominantly adult, little damage is done, but as soon as larvæ appear in sufficient numbers to create definite colonies, rust development proceeds apace. The tender skin of the young fruit is naturally highly susceptible to injury. Furthermore, the injury to the skin of the young fruit is accentuated by the growth and expansion which takes place during development until cracking and splitting, as previously explained, occur.

Nevertheless, there is no cessation of insect activity as the bunch matures, though the population usually decreases somewhat towards the end of the life of the bunch, presumably owing to the fact that the establishment of new colonies on the bunch does not keep pace with the depopulation due to natural causes. The insects definitely avoid those parts of the fruits which have been already severely damaged, especially when extensive callousing has taken place. Thus, their feeding activities in the later stages of the life of the bunch produce an extension of the area affected.

Severe damage to the young fruit results in the development of a callous-like appearance, usually rather dull red or even ochraceous in colour, with fairly deep cracking. On the other hand, rust acquired by fruit in the later stages of maturity is much more superficial. The colour is usually bright red and there is little callousing. Cracking, if any, is usually only slight, except perhaps in the colder months. It is improbable that this type of rust would ever result in splitting, i.e., exposure of the flesh. Splitting of full fruit is a common phenomenon at certain periods of the year, particularly in the autumn, and care must be taken to differentiate between that due to rust and that which would occur even in the absence of rust. The extent and intensity of discolouration and surface cracking will indicate the true cause of the splitting.

As rust may occur at any time during the development of the bunch, any control measures must be effective over the whole period of development. This point was illustrated by experimental bunches which were kept commercially clean for twelve weeks by the application of certain control measures. In the absence of any further treatment during the ensuing four to six weeks before harvesting, maturity being retarded by a dry season, a certain amount of commercial rust developed.

(*e*) *Incidence in Relation to Thrips Population and Time of Year.*—As the incidence of rust is dependent on the thrips population, environmental or other factors which influence the insect are reflected in the

amount of damaged fruit. Unless the insect population reaches a certain level, rust of commercial importance will not eventuate. Thus the effect of topography, age of plantation and cultural measures such as spraying, chipping, &c., on the thrips population is directly reflected in rust incidence.

The normal seasonal fluctuation in insect numbers naturally determines the seasonal incidence of rust. There is, of course, a lag between the time of actual injury and the harvesting of rusty fruit, due to the developmental period of the bunch. Rust may appear on young bunches as early as the end of October in southern Queensland, but commercially rusty fruit is seldom cut before the end of December. Thus, bunches thrown before October usually escape commercial rust provided a normal rate of development is maintained, the fruit maturing in slightly more than three months during the warmer period of the year.

The stage at which commercial rust appears on bunches thrown during the last quarter of the calendar year depends on the rate of thrips population increase but, if the insects are abundant, all these bunches will become rusted to a greater or lesser extent. If the summer thrips population is late in reaching its peak the onset of commercial rust will, of course, be delayed. Thus, on one plantation during the 1935-36 season commercial rust was not noted on mature and submature bunches until the end of February. Had seasonal conditions been normal, the bunches thrown during October and early November may have been free from severe blemish. Actually the early summer was abnormally dry and the fruit matured very slowly. Bunches had to be left hanging in the plantation much longer than usual and became rusty during the later stages of development.

Rust is usually worst on bunches thrown in January, February, and March. Later it becomes progressively less important until the end of April, and bunches thrown after that date are usually free from commercial blemish. The danger period may be slightly prolonged if an abnormally mild autumn follows a summer of severe thrips infestation. Thus, in 1936, a season of this kind, slight rust was observed on bunches thrown as late as the last week in May. There is some evidence to suggest that the decrease in rust development in the autumn may be due in part to diminished feeding activities by the insects, as there seems to be a definite time lag between the cessation of severe injury and the marked decrease in thrips population.

Bunches thrown in the late summer and autumn mature slowly and hang in the plantation throughout the winter. Thus, while bunches thrown in January and February will probably be cut in rather more than three months, autumn bunches require a much longer period to mature and rusty fruit may even be found on bunches cut as late as October. From January to August, however, is the period during which the bulk of the severely damaged fruit is harvested. Because of this time lag many growers are inclined to overlook the fact that the damage to the fruit is mainly caused from December to March and that that is the period when control measures must be applied.

(*f*) *Rust Development in Relation to Factors other than Insect Population.*—Smith (1934) has discussed at some length the relation of rust incidence to plant growth and bunch type. He points out that any slowing down of plant growth at the time of bunching, due to climatic or other conditions, results in a predisposition of the bunch to severe

rust incidence. Such a growth check may not prevent the production of a normal bunch. On the other hand it may be conducive to two abnormalities recognised by Smith and termed by him "non-inversion" and "delayed inversion."

In the case of non-inversion the bunch never attains a pendant position, remaining practically erect in the plant throat. This condition is due to an almost complete check in plant growth at a critical period of bunch development. "Later on growth may be resumed, but in the meantime the structure of the various parts of the plant associated with the bunch have become much less plastic, and, instead of a simple resumption of growth, a type of plant cretinism is observed in which the bunch stalk is twisted within the pseudostem . . . ." This type of abnormality is of little commercial importance in southern Queensland. Bunches of this type are usually associated with acute plant debility and would be of little value even if properly thrown.

The phenomenon of "delayed inversion," which can perhaps better be described as "incomplete inversion," is, on the other hand, of considerable importance. Incomplete inversion is due to less acute forms of the causes responsible for non-inversion. Affected bunches are commonly described as "choked," as are also non-inverted bunches. The bunch, instead of being fully pendant, stands out at an angle from the plant. The stalk from plant throat to top hand is comparatively short and the top hand or hands are thus compressed at or near the top of the pseudostem. The fruits are held in this position throughout the life of the bunch and usually remain fairly straight instead of developing the normal curvature. Gross distortions of individual fruits may at times occur. At the same time the length of the internodes between hands is subnormal and the fingers do not separate as readily as usual. Thus the whole bunch may be of a compact nature.

The two bunch types just described are, of course, merely examples of a more or less regular series at one end of which only the top hand is constricted, while at the other the bunch has scarcely emerged from the throat of the plant.

The susceptibility to rust of such bunches is readily understood from a consideration of two points. In the first place, the longer the period between the first appearance of the bunch in the plant throat—at which time or shortly afterwards thrips are able to enter beneath the bracts—and the completion of inversion, the greater will be the initially-acquired adult thrips population. This *a priori* implies a greater final insect population and, other things being equal, more severe rust incidence. In the second place, as the rate of bunch inversion is slow, the hands remain compressed and the bracts are retained for a relatively long period. Thus, such bunches provide optimum conditions of shelter for an unusually long time. In addition, owing to their compacted state, the area of the contact surfaces between fruits is greater than normal. As a result the rusted area on individual fruits usually shows a pronounced increase.

The economic loss sustained through choked bunches can be readily appreciated on examination of rust-affected plantations. Choked bunches are always the most severely blemished, while the injury is often accentuated by the undue exposure of the top hands to the sun. Further, the top hands, which are usually a total loss in choked bunches, normally contain the largest and best quality fruit.

In southern Queensland choked bunches may be caused by three factors. First, and most important, is soil moisture deficiency. The banana plant, indigenous to tropical regions with copious rainfall, is adversely affected by dry conditions which, in the south, usually occur in the spring and early summer. If the dry spell coincides with a certain stage in bunch development choked bunches will result. An excellent example of the influence of dry weather was observed in the 1935-36 summer when the end of 1935 was rather dry and January and February of 1936 disastrously so. A year-old plantation of splendidly grown plants bunched in January to March. The bunches contained more than the normal number of fruit, a character which was largely due to favourable growing conditions prior to emergence, but, as a direct result of the dry weather, the majority of the bunches were choked to such an extent that one or more hands were badly compressed.

The second factor influencing the production of choked bunches is low temperature. In southern Queensland, growth is checked to a considerable extent during the winter and choked bunches may be thrown on almost any plantation. Fortunately, thrips activity is then at a minimum.

Thirdly, general plant debility, particularly during the second and subsequent years after planting, may be a cause of choked bunches. Plant deterioration of this type is reflected chiefly in the size and quality of the bunch, but the bunches are also often imperfectly thrown and the effect of adverse climatic conditions, such as deficient rainfall, are particularly severe.

The above discussion indicates quite definitely that no small part in rust control may be played by a programme of plantation management which aims at the elimination of bunch types susceptible to rust development and unsuitable for the efficient application of control measures.

In the south, the normal bunch type of the Cavendish variety varies with the season. Thus, bunches thrown in September and October are large and well-shaped with good quality fruit, being probably the best bunches of the year. These are followed by the November "dump" type which are small bunches of irregular conformation with short fruit. December bunches are very big but the fruit is small. From January onwards the bunches remain big and the fruit gradually improves in size from the December type. With the onset of the cooler weather bunches tend towards the choked type, the fruit of which is rather straight, i.e., without the natural curvature. The normal types of bunch produced during the period of maximum thrips activity are thrown well out from the plant with hands well spaced on the bunch stalk, and are thus least favourable for rust development and most favourable for rust control measures. The abnormalities described above due to retarded plant growth may, of course, be superimposed upon any of the normal seasonal bunch types, and the vigour of the plant is thus of more importance than the seasonal bunch type.

The amount of shading given to the bunch by the plant foliage may also influence the incidence of rust. In the average plantation some bunches may be almost completely sheltered from the direct rays of the sun, the majority will be shaded for a portion of the day, while a few, exposed bunches at the ends of rows, may be exposed to direct sunlight for practically the whole day. Undue exposure to sunlight does seem

to accentuate rust development, for exposed bunches are invariably amongst the worst affected. The top hands of choked bunches, for instance, are usually abnormally exposed, though, of course, in this case other factors contribute towards severe rust development. Whether this accentuation is due to intensified thrips activity or to an acute reaction of the plant is not clear.

This question again emphasises the need for sound cultural practices in order to maintain the plantation in good growing condition. Unhealthy plants tend to produce erect leaves, which provide much less shelter for the bunches than that afforded by the spreading leaves characteristic of healthy plants.

(*g*) *Incidence in Relation to Variety of Banana.*—The Cavendish is the most extensively grown variety of banana in Queensland, the acreage being many times greater than that of all other varieties together. In the thrips infested areas, the other varieties are represented by small scattered patches growing either alone or adjacent to Cavendish patches. The greatest acreage of other varieties is probably in the Brisbane and near-Brisbane areas, which are, for the most part, free from thrips.

Whenever possible, the amount of rust development on Lady Fingers, Sugars, Mons Maries and Gros Michels, (Queensland Gros Michels may not be true to type) has been investigated. When any of these varieties have been growing adjacent, or in close proximity to Cavendish plants, rust development on the bunches has been comparable.

Any apparent differences between the common varieties would probably be associated with the taller habit of growth or with variations in bunch type. In southern Queensland these differences are usually insufficient to influence thrips activity or rust incidence. However, in north Queensland, the Gros Michel, and perhaps the Lady Finger, may produce a particularly open type of bunch which is less susceptible to rust development.

[TO BE CONTINUED.]

SHEEP LAND FOR SELECTION.

A resumption from Welltown Holding has been surveyed as portion 2, parish of Taraba, and will be open for Grazing Homestead Selection at the Land Office, Goondiwindi, on Tuesday, 11th October, 1938.

The portion is situated about 6 miles south from Bungunyah railway station on the Goondiwindi railway.

The portion has an area of 10,517 acres and the term of lease will be for twenty-eight years at an annual rental of 6½d. per acre for the first seven years.

A condition will be that the selection must be stocked to its reasonable carrying capacity with the applicant's own sheep during the first three years.

The portion is watered by the McIntyre River and by two earth tanks, and the country is described as black, reddish, and chocolate soils, lightly timbered and grassed with Mitchell, Flinders, Coolibah, and various other good sheep grasses and herbage. It is excellent wool growing and breeding country.

Free lithographs and full particulars may be abtained from the Lands Department, Brisbane, the Land Agent at Goondiwindi, and the Queensland Tourist Bureaux at Sydney and Melbourne.

Dressed Poultry Marketing.

P. RUMBALL, Poultry Expert.

THE marketing of dressed poultry can be made profitable, especially when direct contact with the consumer is practicable. It should appeal to many poultry farmers in places in which little effort has been made to supply a bird ready for the oven; and as these centres are distant from the larger markets, freight costs and other charges could be saved. The greatest difficulty to be encountered in marketing dressed poultry is the maintenance of supplies. It is possible, however, especially when the purchase of supplementary supplies from neighbouring farms is practicable, although such a practice is not generally recommended, as there is always the risk of introducing some infection or pest into one's own flock. In one's own experience, many cases of infestation with fowl tick have been actually traced to the introduction of fowls from other flocks. Farmers who propose to enter the dressed poultry business, therefore, should plan for a continuity of supply. In general farming practice cockerels should be available from August to February. Obviously, early in that period some birds would be exceptionally young, while those sold in February would be full grown. To keep cockerels after this period would mean added costs and lowered quality because of age. Culled hens, however, would be available from the beginning of this period, or even earlier, and until May. Old hens in good condition are usually in fair demand and, provided the consumer knows what class of bird is purchased in order that the proper cooking process be followed, this demand could be increased, with better values resulting.

There is then a gap that has to be bridged—the period after the old hens have been cleared and before cockerels are available. The only method by which a continuity of supplies is possible is by hatching out of season, the use of females still in production, or by caponizing some of the later cockerels. Hatching out of season is not recommended. The use of some laying hens has a lot to commend it; and it means a severer culling of the laying flock. Some of the best flocks in the State are those of poultry raisers who have developed this business, and their flocks have only been brought to this condition by heavy culling.

Production of Capons.

The question whether caponizing is profitable or otherwise is best left to the individual producer to decide, because of the varying features governing the commercial side of the proposition—that is, cost of feeding and ultimate sale.

The capon, however, has advantage over the uncaponized bird in weight, quality of flesh, and cost of maintenance. The opinion frequently expressed that capons grow to a greater size than cockerels is wrong. When the reproductive organs are removed cockerels lose their fighting instinct and lead a lazy, inactive life, thereby putting on more weight or flesh, but not size. It is possible, also, to retain capons until they are fully developed, and to market them as desired. This is not so with

cockerels, as they become troublesome and lose the quality of flesh. The inactive life a capon leads naturally reduces food consumption, and so it is kept at a greatly reduced cost, which materially assists a producer in regularity of supply. To the farmer engaged in diversified production, however, capons should appeal most, inasmuch as they can be allowed to range with the farm flock. There is no necessity for segregating sex, and because of sterility the quality of eggs is in no way affected.

Appearance of a Capon.

The comb and wattles of a capon do not develop, and the head remains small and colourless. The pointed feathers of the neck and those in front of the tail and large sickle tail feathers grow profusely, and in countries where capons are appraised at their true value as table birds these feathers are left on the bird in dressing and serve as a trade mark.

Marketing.

At present the caponizer should cater for regular customers, but if supply exceeds demand the surplus should be sold when young birds of quality are scarce, which happens every year from March onwards until early cockerels are on the market—say, September. Cockerels of any breed may be caponized, but breeds of the light or small varieties, such as Leghorns, are not as suitable as larger varieties, such as Orpingtons, although in this article leghorns have been used for the purpose of illustration.

The age at which the operation should be done naturally varies with different breeds and the development of the subject, but generally the correct period is between eight and twelve weeks, when the chickens are about 2 lb. in weight. The next point which the caponizer must keep in mind is light. A good light (sunlight) is essential, especially to the inexperienced operator. With practice he may operate under other conditions, but, for a start, the position of the various organs must be thoroughly understood. The third requirement is to refrain from feeding and watering the bird for at least twenty-four hours—thirty-six hours would be better. Under such treatment the intestines become empty and will fall away from the side where the incision is made, and, as well as lessening the chance of injury, permit of the reproductive organs being seen much easier.

The Operation.

In addition to knife, spreader, probe, and forceps, a table and two pieces of soft cord with a running noose at one end and two half-bricks attached to the other, and a basin containing a weak antiseptic solution, are necessary. The table may be a packing case or barrel, or the operator may prefer to make a more elaborate and, possibly, more convenient bench. The bird is fastened down with the cord and bricks, one noose being placed around its legs and the other around its wings close to the body, and the bricks allowed to hang down on either side. The correct position is illustrated in Plate 81.

The next move is to pluck a few feathers from the seat of operation,

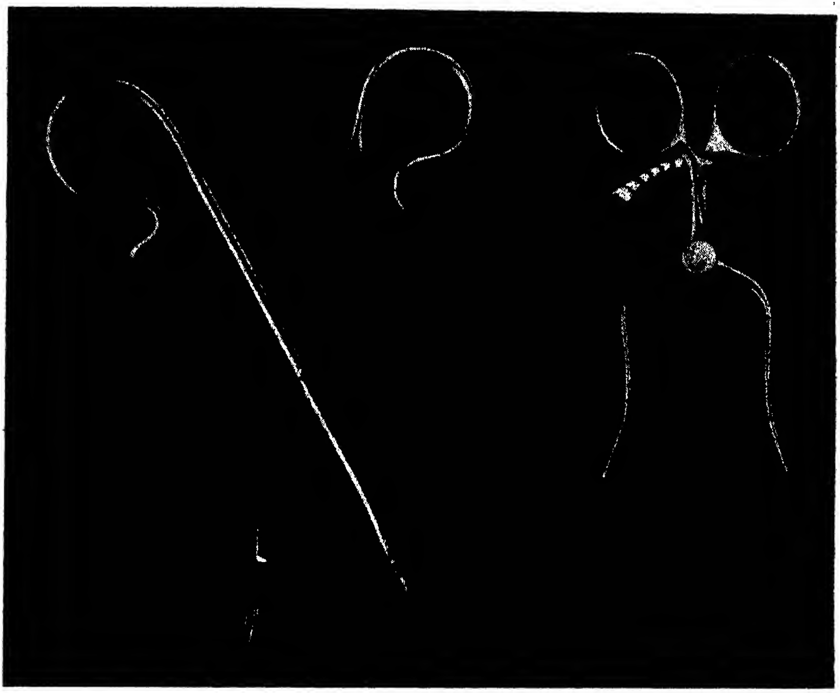


Plate 80.
The spreaders and extractors recommended for general use.

Plate 81.
Bird in position for caponizing. It can be turned over without unfastening, which facilitates the operation.

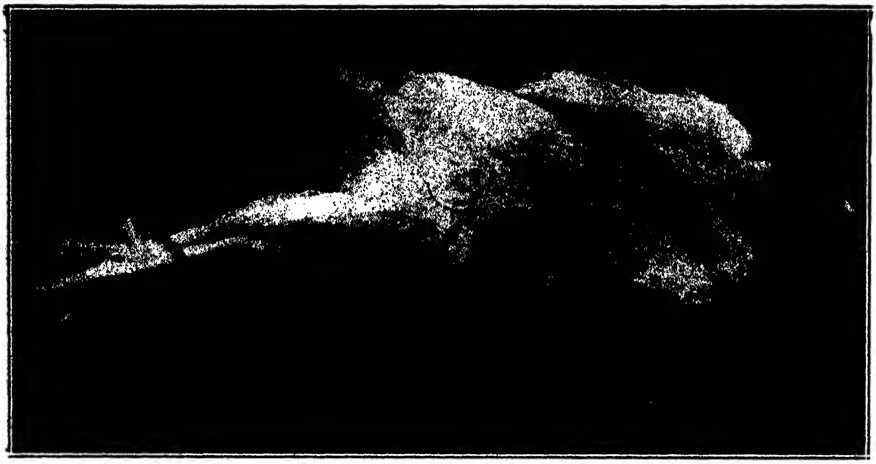


Plate 82.
Clearing the feathers in front of hip joint and holding others back by damping.

Plate 83.
Drawing skin back with forefinger and making incision between last two ribs.

which is just in front of the hip joint. In a bird of the correct age very few feathers will need removing, and those that are lying in the way can easily be held aside by damping them with an antiseptic solution, which should always be used to cleanse the site of the incision. The clear space obtained by doing this is illustrated in Plate 82. Having done this, the correct position to make the incision must be ascertained. This is best done by placing the thumb on the hip joint, gradually moving the forefinger along the body until the last rib is felt. It is between the last two ribs that the incision has to be made, but before doing that draw the skin as far back as possible with the forefinger as shown (Plate 83) so that when the operation is completed and the skin goes back to its natural position the wound in the skin and abdominal cavity are not directly opposite. Having made the cut, insert the spreaders, enlarge the opening to about 1½ inches, and gently spread the ribs as shown in Plate 84.

Plate 84.
Insert spreader, enlarge opening, and tear membrane which covers intestines.

When this is completed a thin membrane will be noticed covering the intestines. This has to be torn apart before the testicle can be seen. The testicle is easily noticed if the bird has been properly starved. It is yellowish white in colour, runs parallel to the backbone, and in birds of correct age about ¾ in. long and a little thicker than a plump grain

Plate 85.
Close-up view showing position of testicle.

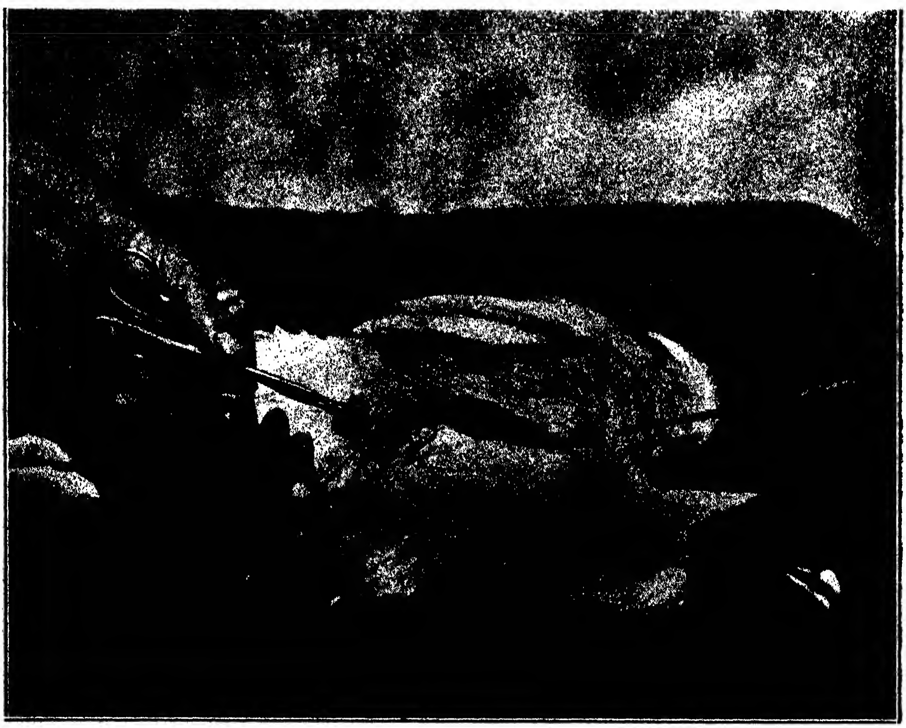


Plate 86.
Severing appendages after removal of testicle.

of wheat. The position of this is shown in Plate 85, although somewhat enlarged because of the advanced age of the bird operated on. With the forceps take hold of the testicle, being careful not to grasp the large artery which runs parallel with and close to it. Withdraw the instrument as shown in Plate 86, with testicle attached, with a twisting motion, and after appendages have been twisted up and pulled out cut them about 1½ to 2 inches from testicle to make certain that no portion of the organ remains.

When the operation is completed on the one side, turn the bird and repeat the process. Some operate from the one side only, but this method carries more risk, and the saving in time is doubtful.

In about a week it is a very difficult matter to find where the incision had been made—a few wind puffs may sometimes be observed, but it is merely necessary to prick them.

After the operation of caponizing turn the bird loose. If the operation has been correctly performed the skin covers the wound, and no dressing of any description is required. It is as well, however, to keep the capons in clean quarters and away from other fowls for a few days; but beyond this further treatment is unnecessary.

Fattening.

If poultry have to be sent long distances for sale special fattening treatment is not recommended, for the weight increase that may be obtained by two to three weeks' special attention may be lost in transit and in the sale room. It is a practice of many poultry auctioneers to hold poultry temporarily in the hope of obtaining greater values for the farmer. The birds are fed and watered, but it will be realised that the practice is not such as to be conducive to the retention of the condition gained on the farm by special feeding.

General Health.

Poultry raisers should aim at keeping growing stock and laying hens in good condition by good feeding. If that is done, culled hens and unwanted male birds will always be in a fit condition for market. Fowls that are not so conditioned are probably weak constitutionally and unlikely to respond to treatment. Sometimes, however, worms may be the cause of a poorly fleshed condition. In such cases fattening may be justified, but before commencing this treatment rid the birds of worms. Dr. F. H. S. Roberts, Veterinary Parasitologist of the Department of Agriculture and Stock, recommends the following treatment:—

Flock Treatment.—Flock treatment can be applied with success only when the birds are kept under intensive or semi-intensive conditions. The procedure is to mix nicotine sulphate with the mash at the rate of ·5 c.c. of nicotine sulphate for every 1 lb. of dry mash. The amount of nicotine sulphate required is incorporated with just sufficient water so that when mixed the mash is flakey. The mixing should be thorough, so that no lumps remain. This treated mash is mixed fresh daily and fed continuously for four days.

Period of Fattening.

Confinement is necessary for any special fattening process. This restricts exercise, with the result that the maximum quantity of food consumed by the bird is used for building up flesh and body condition.

Lack of exercise, however, soon results in a loss of appetite. Some birds may only feed well for ten days; others, again, may be kept going for three weeks. The most important thing to remember is that birds may only be kept in close confinement for a short period without losing appetite, and when that is observed a halt must be made. These remarks apply particularly to the system of crate fattening.

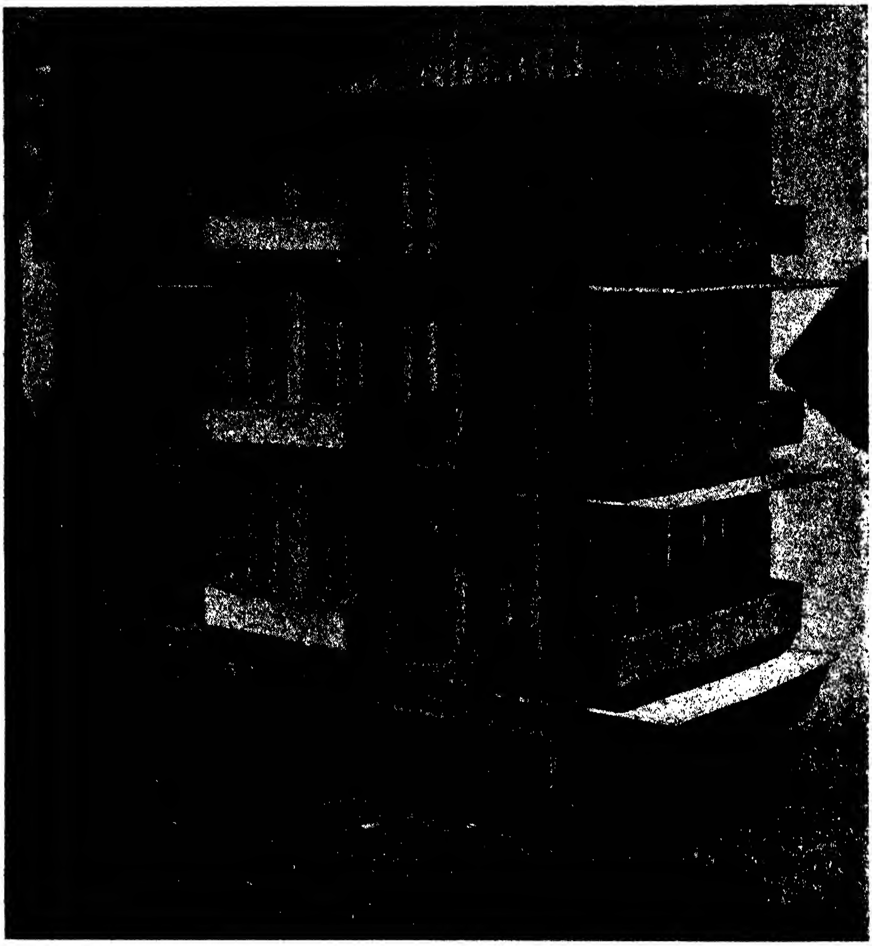


Plate 87.
A compact battery suitable for the fattening of poultry.

Pen Fattening.

Cockerels present a problem, particularly all light breed varieties, because of early development of sexual activities. The earlier they are taken away from pullets the better. Cockerels have to be kept growing, and should be fed the same as pullets until placed on special fattening ration. When large enough for the trade they should be graded according to size.

In pen fattening, both hens or cockerels, as the case may be, should be placed in small pens and in groups of about twenty, allowing 2 sq. ft.

of floor space for each bird. Under these conditions there is naturally some crowding, and it is essential to protect the food and water from soiling. This is best done by having the feeding receptacle outside the house, the bird gaining access to it through a grid.

Crate Fattening.

Crate fattening is only desirable when adult birds or well-grown cockerels are to be fattened, and then only for assured markets. This method requires more attention and so adds to the work of the farm, hence the necessity of obtaining returns commensurate with the cost of labour and material used. A crate 2 ft. long, 18 in. deep, and 18 in. high is simple of construction. This crate will hold three to four birds, according to their size. A long crate of similar dimensions divided into 2-ft. sections, and raised on legs to facilitate the work, may be built. The sanitation of the crate should, of course, receive strict attention; dirty crates soon lead to sickness and poor results. A V-shaped food trough to hold porridge or gruel, if the fowls are so fed, and receptacles for grit and charcoal are all the furnishings required.

Crates should be set in a well-ventilated shed. Good light is essential to encourage feeding, but after feeding it is desirable to darken the shed to induce rest.

Feeding.

Feeding from the commencement is most important if good results are to be obtained. A keen appetite is necessary, and is best obtained by giving the birds a dose of salts with their first feed at the rate of 1 oz. to each twenty full-grown birds; and then, if food is still in their crop at any subsequent feeding, it is wise to miss a feed. For the first two or three days, and until the birds settle down in their new quarters, feed sparingly. After this they may be fed three times a day and given all they will pick up quickly, but it is desirable to feed so that the birds could eat a little more, especially as they are being fed three times daily. The troughs should then be cleaned. Grit should be available at all times, or put out in the troughs at least three times a week.

The feed used should be easily digestible and palatable. Having this in mind, ground grain or meals should be used, and not whole grain. To make the food palatable ½ per cent.—say, a pinch or two—of salt should always be incorporated in the mixture. Another food which increases palatability is molasses. This could be used to the extent of from 3 per cent. to 5 per cent. Where possible, skim milk, butter milk, semi-solid milk, or milk powder should be incorporated in any mixture. With any milk product an equal quantity of any three of the following—wheat meal, maize meal, barley meal, ground sorghum, or pollard—would give excellent results. In any mixture, however, it is desirable to incorporate maize meal, as the condition put on when this food is used is not lost to the same extent in transit as in the case with some other foods. In the utilisation of semi-solid buttermilk, 20 per cent. may be added to any ration, and with buttermilk powder 10 per cent. Sufficient liquid is necessary to mix the ground grains to a consistency that will enable it to pour freely into a pan or bucket.

Potatoes, both English and sweet, either raw or cooked, in conjunction with ground grains, also are useful as a fattening ration, and may be used to the extent of one-third of the bulk, the mixture to be made to a porridge consistency.

Milk is credited with the placing of fat in the muscular tissue of poultry and materially improving the flavour, but in countries where it is used extensively it is also claimed that there is a greater shrinkage with milk-fed birds than with any other system; consequently, the shorter the distance from market the better.

Poultry raisers who have not home supplies of skim milk may be forced to use meat meals in lieu of milk products. To them it is suggested that 10 per cent. should be incorporated in any mixture, such mixture to be mixed with water.

Dressing Poultry.

Killing.—Before slaughter the birds should be fasted for twenty-four hours, in order to facilitate drawing. Water, however, should be supplied. For local trade, killing may be done by removing the head with an axe, or by dislocating the neck. The latter method is very satisfactory and much cleaner, and is probably in more general use.

Dislocation of the neck is done by holding the legs and end of the wings in the left hand and grasping the head of the bird with the right hand, the thumb being behind the head and the second finger under the beak close to the throat. Next bend the head back almost at right angles and give a sharp pull with the right hand. This causes a dislocation of the neck where it joins the head, and severs the blood vessels. Stretch the neck slightly to create a cavity for the collection of the blood and hang the bird up until bleeding has finished, which will be indicated by an enlargement of the neck. Dislocating the neck of a bird at first may appear difficult, but by stretching the bird over the right hip one will soon acquire proficiency in the method.

For the export trade birds are generally killed by severing the jugular and debraining, as it is claimed that this method gives the best bleeding and that debraining facilitates the removal of the feathers when the birds are to be dry plucked.

Plucking.—There are four methods of plucking—dry plucking, scald, semi-scald, and wax plucking. Unless a person is very proficient, the dry method of plucking is laborious and slow, and for local trade is not essential; while for the wax method a fairly elaborate equipment is necessary.

Scald Method.—The water should be held at a temperature of 180 degrees Fahr. With this method it is essential to guard against the partial cooking of the skin, which causes the bird to discolour rapidly and the skin to tear easily when the feathers are being removed. In scalding, the birds should be held by the head and feet and drawn through the water with the feathers and not against them in order to prevent the water penetrating to the skin. By this process the steam will reach the base of the feathers, and the length of time of scalding required judged by pulling a few of the thigh feathers.

After scalding, first pull the main tail and wing feathers and then start on the breast, then the small body feathers, taking care to avoid tearing the skin of the breast. When a bird has been properly scalded the feathers may almost be rubbed off. With a blunt knife any pin feathers left may be removed easily by grasping them between the thumb and the knife.

Semi-scald.—This is a method that has come into use in recent years, and it is claimed that the process has not the discolouring effect when the birds are kept in storage for any time, and that the finished bird is in appearance equal to that of the dry-plucked bird.

The temperature of the water used for the method is between 125 deg. and 130 deg. Fahr. The birds are immersed in this water from a quarter to half a minute. Picking the bird after being submitted to the semi-scald method is quicker than the dry picking method, and the pin feathers are easy to remove. The same plan of plucking is followed in this method as any other—i.e., the tail, wings, breast, &c.

After plucking, a considerable number of fine hairs will be left, which, for appearance sake, it is desirable to remove. Many dressers do this by singeing with lighted paper. This invariably causes an objectionable darkening of the skin, therefore it is better to pass the bird over a flame of a methylated spirit lamp.

Cooling.—To cool the carcase, do not lose sight of the keeping quality. Cooling as rapidly as possible is desirable, but if the birds are to be kept for any length of time they should be placed on racks in a store at a temperature of from 30 to 40 deg. Fahr.; whereas if they are to go into immediate consumption cold or iced water may be used.

Dressing.—Lay the bird on its breast and with a knife cut the skin at the back of the neck from the body to the head. Loosen the neck, gullet, windpipe, and crop from the skin. Then remove the neck by cutting it close up to the body. The crop and windpipe can then be pulled out and the neck skin then severed from the head. Then insert the index finger or a knife and break away all connective tissue.

Turn the bird around and make an incision between the vent and the tail, then with the index finger pick up through this opening a loop of the intestines and draw out. When out sufficiently, cut around the intestine and remove the vent. Remove the intestines, then gizzard, liver, heart, and lungs, all through this opening.

With aged birds it is sometimes desirable to remove the sinews of the leg. This is easily done by cutting the skin around the shank about ½ in. from the hock; then break the leg of the bird close to the cut by bringing the leg sharply down on the edge of the table. The lower part of the shank and foot will then hang only by the sinews. The foot of the bird is then placed in a grip or hook, and by grasping the thigh in the hand, and giving a sharp pull, the sinews are torn out.

Trussing.—Draw the skin of the neck on to the back, locking it down by folding the wing tips under on to the shoulder. This closes effectively the cavity in the front of the bird and gives it a nice finished appearance. The "drum-sticks" may be tied down with string or skewers. Many, however, make a point of just holding them in place by drawing the skin of the abdomen, where cut, over the ends.

Milk Grading Tests.

(*Continued from page* 179, *August issue.*)

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Research Laboratory.

The Sediment Test.

THE receiver of liquid milk from a number of different sources will find the Sediment Test of great assistance in convincing the careless dairy farmer of the impurity of his supply. This simple test shows the nature and amount of visible dirt extracted from a measured quantity of the milk by forcing the milk through a standard cotton disc of definite size. The test can be made in the presence of the farmer on the receiving platform if necessary, and he can immediately examine the disc and compare the result with those given by previous tests.

Advantages of Sediment Test.

1. The Sediment Test is useful in improving the purity of liquid milk supplies by demonstrating the actual foreign matter present.

2. It is simple, cheap, and calls for no technical knowledge.

3. It is very rapid, being completed in a few minutes, so that if required results can be reported to the farmer immediately.

4. Sediment discs can be dried and mounted and marks awarded for cleanliness.

5. If tests are carried out regularly, an interesting record can be kept showing each supplier's improvement. Alternatively, discs can be mounted on separate cards, dated, and returned to the farmer with grading comments and the marks gained.

Carrying out the Test.

Sampling for the Sediment Test is important, for, obviously, foreign matter will tend to settle out to the bottom of the can, and thorough mixing is essential. One pint is the usual amount taken but a larger amount may be used—less than this tends to be not a representative sample—and a test is made from each can sent in. The can of milk is well mixed with a stirrer and one pint removed at once by means of a measure or dipper into the tester. This consists of a metal cylinder tapered at the lower end with a screw-on cap into which fits a cotton disc, kept in place by a wire gauze; the top of the cylinder is closed by a cover, to the centre of which is attached a hand-pump. (*See* Plate 88.) This enables the milk to be forced through rapidly, and an even distribution of sediment is obtained on the cotton disc. The milk is returned to the bulk. The disc is then removed and allowed to dry on a square of blotting paper, numbered or bearing the farmer's name, in a dust-free place, and a fresh disc placed in the tester, which is then ready for the next sample.

Care should be taken by the operator to handle used discs as little as possible, preferably using a pair of forceps for the purpose. Fresh discs should not be removed from the box in which they are supplied until require, and dust of any sort should be guarded against throughout this test.

Interpreting Results.

The milk grader will, after very little experience with the Sediment Test, be able to discover the suppliers of inferior milk. A maximum of 10 or 100 marks should be decided upon for milk showing complete freedom from sediment, and by continual comparison a standard for awarding points can be arrived at. It is advisable to prepare a standard set of discs as a guide, for no human judgment can be relied upon to be absolutely accurate where appearances are concerned, and the farmer must be able to compare and contrast his tests from week to week for the best results. One test each week, of the whole supply

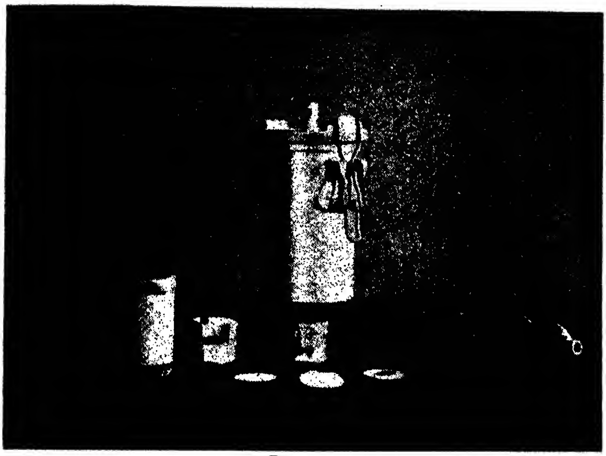


Plate 88.
APPARATUS FOR THE SEDIMENT TEST.

from each farmer, made not always on the same day, will be sufficient to start with—later, once a fortnight or once a month may be quite satisfactory.

The Sediment Test will show clearly which milk contains the largest quantity of visible dirt. It will not, however, show without some additional test which milk is the purest. It must be remembered that by thorough straining into clean cans on the farm and no subsequent opening of them, the farmer may succeed in removing all visible dirt, but this does not necessarily mean that his milk is really pure, for straining cannot remove the invisible impurities and obnoxious bacteria may still be present in large numbers.

Taken in conjunction with careful grading by taste and smell this test is useful in the early stages of improving supplies. When it has achieved its object—that of making farmers aware of visible dirt, and encouraging proper straining as soon as possible after milking—it can be dropped in favour of a more stringent test, such as the Methylene Blue Test which has already been described in this Journal.

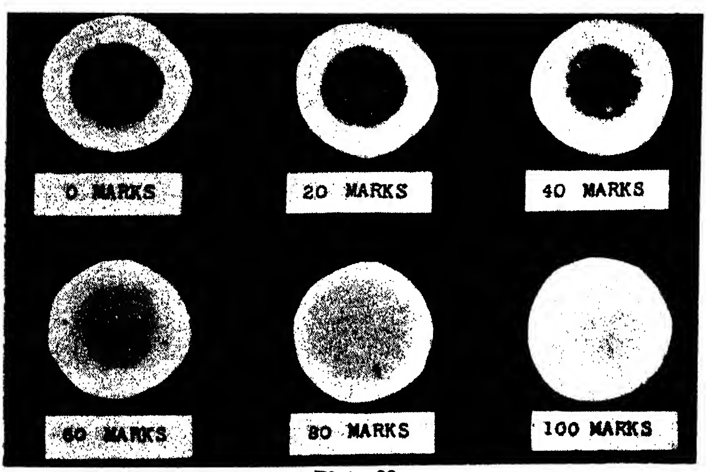


Plate 89.
A SET OF USED DISCS SHOWING METHOD OF SCORING.

Brisbane Exhibition, 1938.

Plate 90.

His Excellency the Governor, the Right Hon. Sir Leslie Orme Wilson, opening the 1938 Brisbane Exhibition. On the dais in the foreground on the right is the Premier of Queensland, the Hon. W. Forgan Smith.

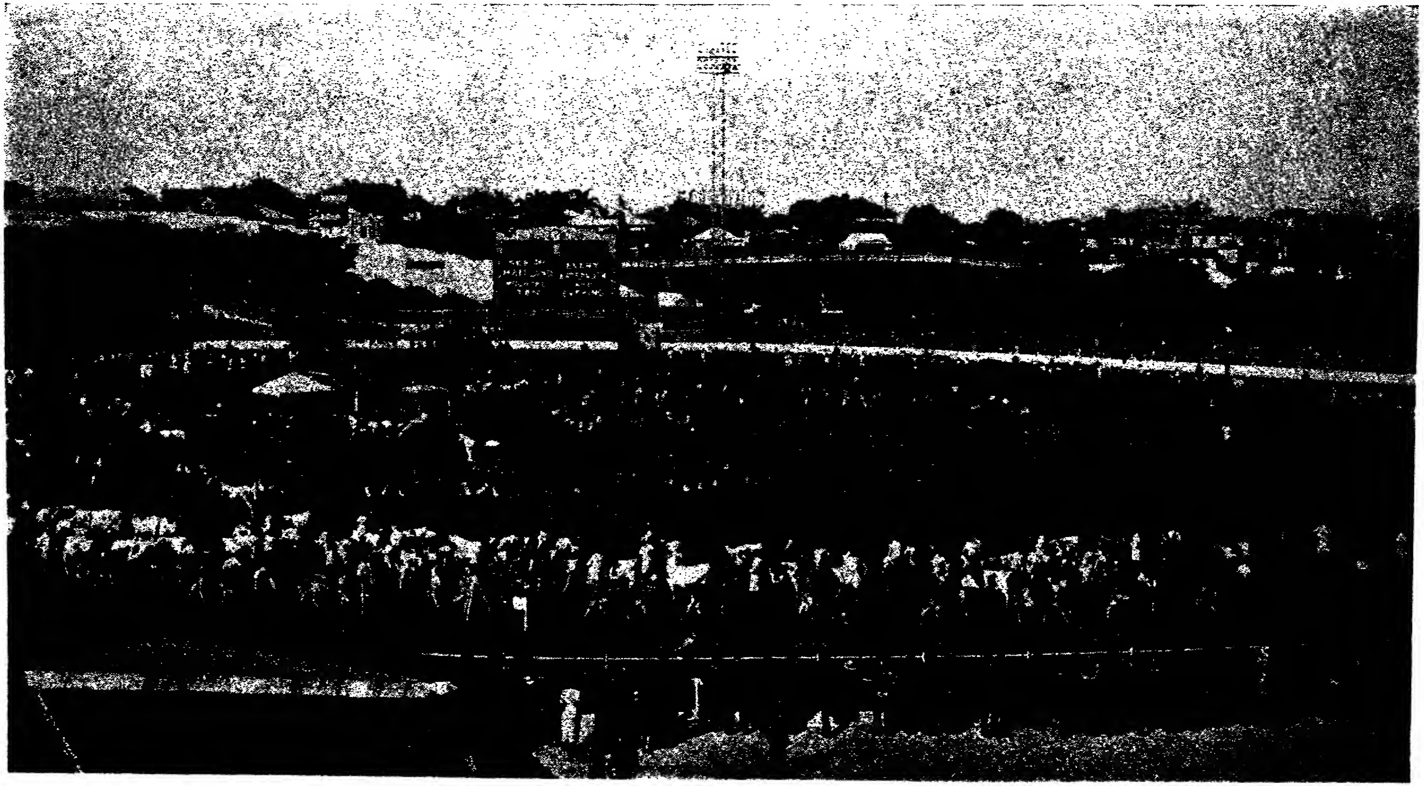


Plate 91.

THE RING AT THE 1938 BRISBANE EXHIBITION.—The daily parade illustrated admirably the high standards attained by Queensland stockbreeders. With the dairy cattle particularly, show-ring shapeliness and cream-can value were happily blended. The plough teams, hacks and hunters, and a Light Horse troop also added to a great stock Show.

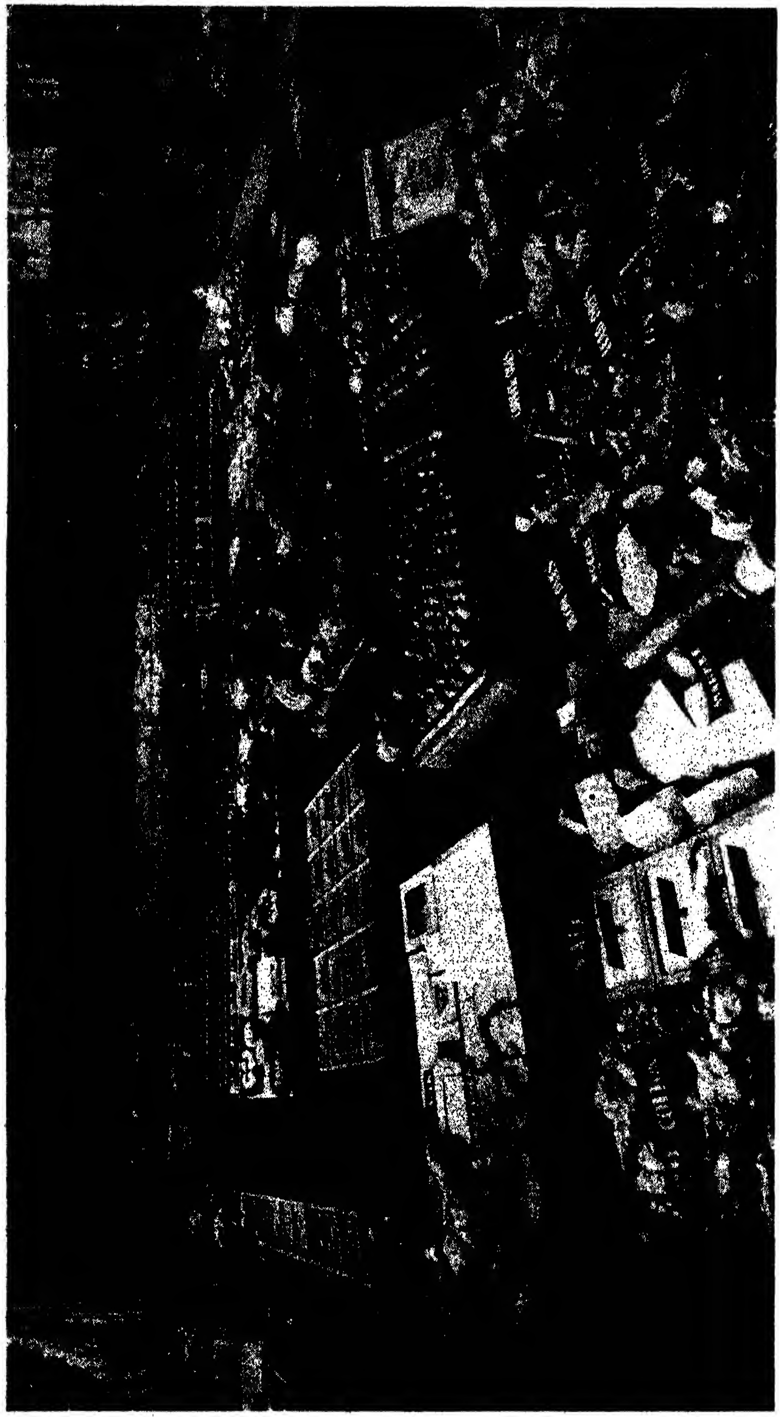


Plate 92.

WEST MORETON WAS THE WINNING "A" GRADE EXHIBIT.—This display of mineral, pastoral, agricultural, and factory products demonstrated the richness of the resources of the country below the Range.

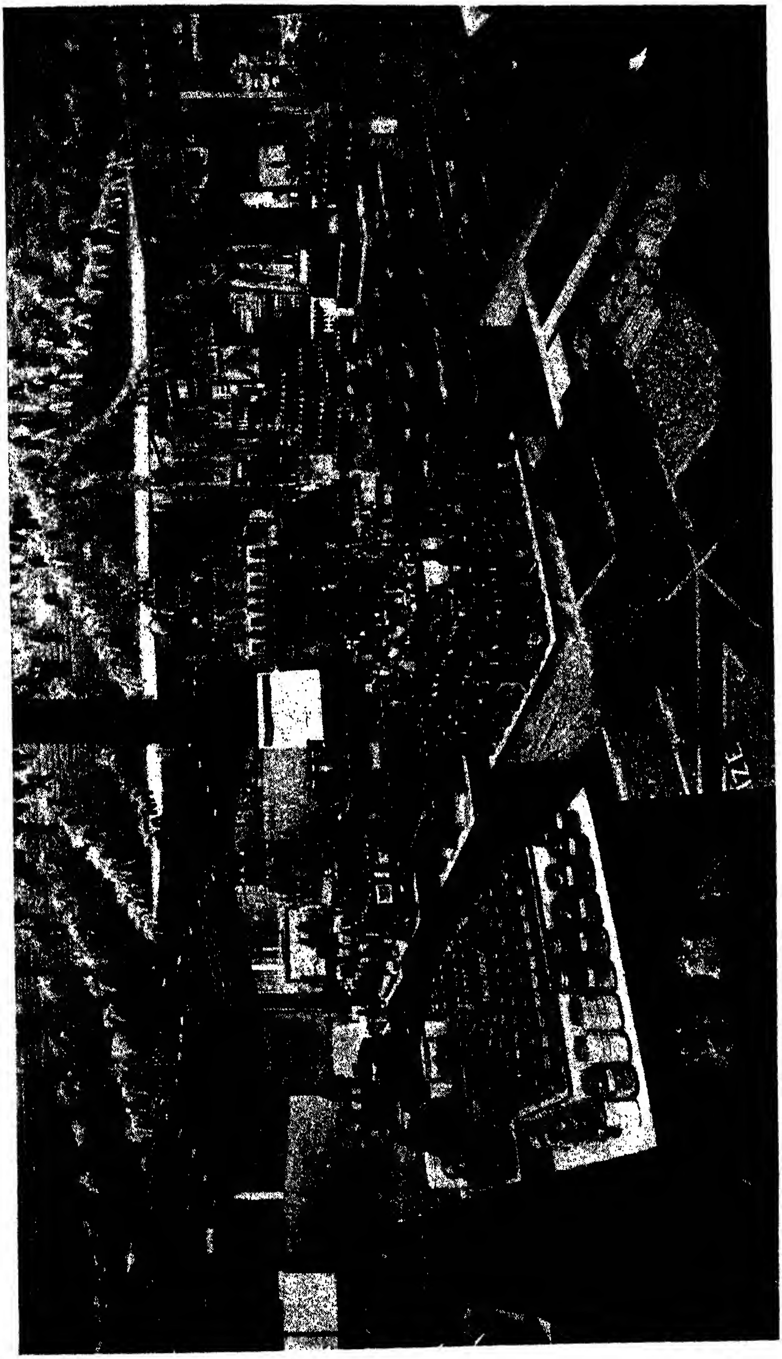


Plate 93.

THE MACKAY-CHARTERS TOWERS COURT.—This was the winning "B" Grade exhibit and illustrated impressively the remarkable diversity and quality of production in North Queensland.

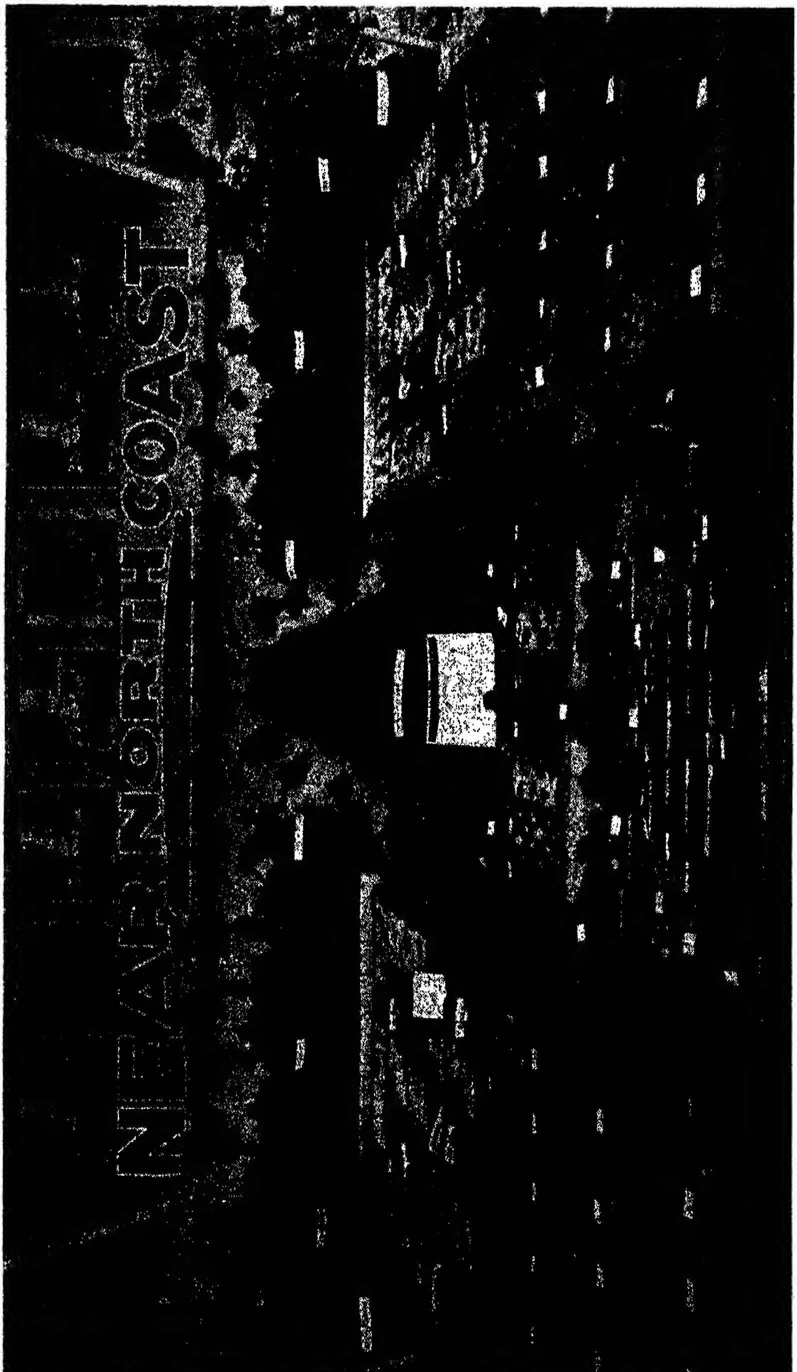


Plate 94.
The Winning District Fruit Exhibit.

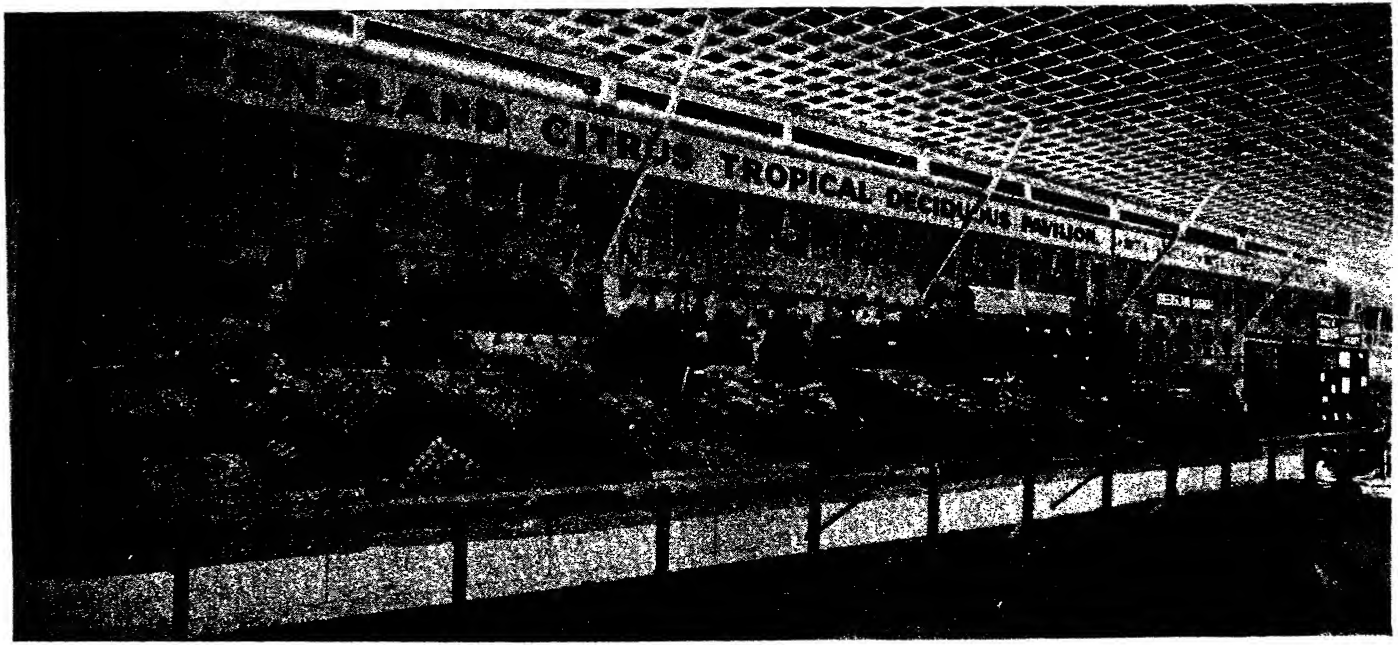


Plate 95.

In the Fruit Pavilion.—Pyramids of pineapples, bananas in bunch and pack, oranges and lemons, apples arranged in geometrical patterns, and a wealth of rare tropical products made up one of the most colourful displays of fruit ever seen in Brisbane.

Plate 96.

A striking exposition in green and gold and russet red of the wealth and health of the Stanthorpe apple lands.

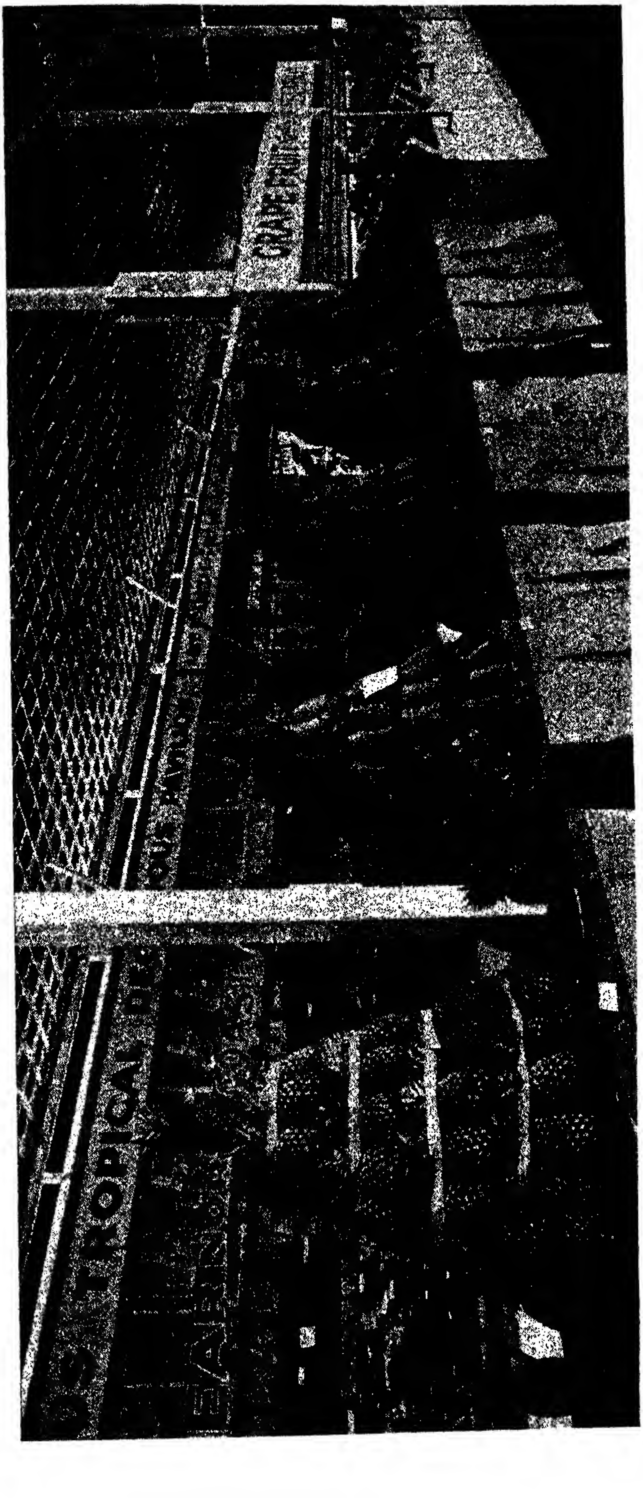


Plate 97.

Pylons of ripening pineapples in attractive array in the general display in the fruit pavilion.

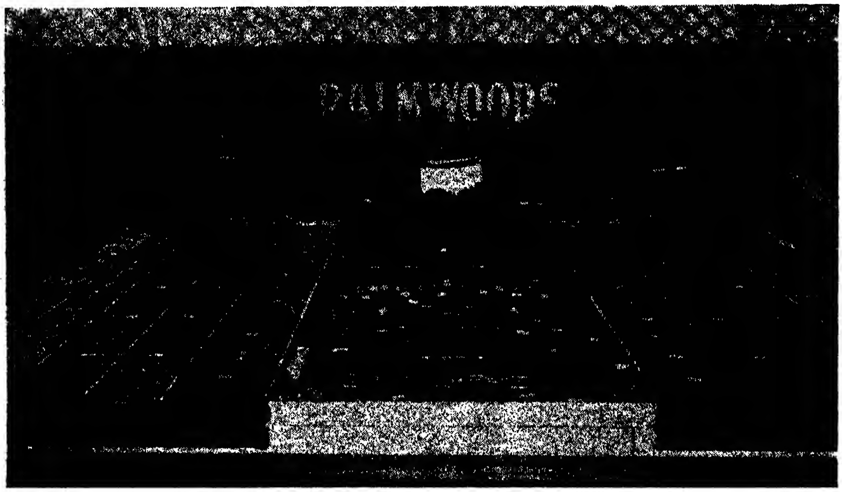


Plate 98.
The Second Prize-winning Exhibit in the District Fruit Competition.

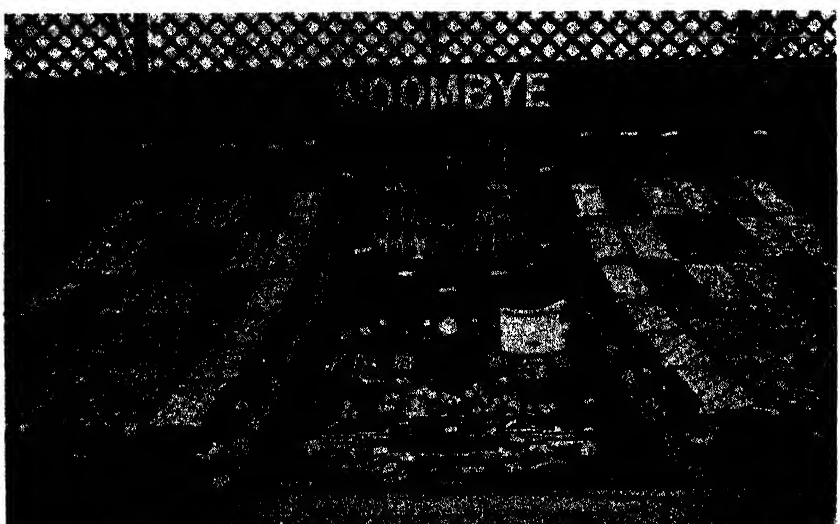


Plate 99.
The Third Award went to Woombye.

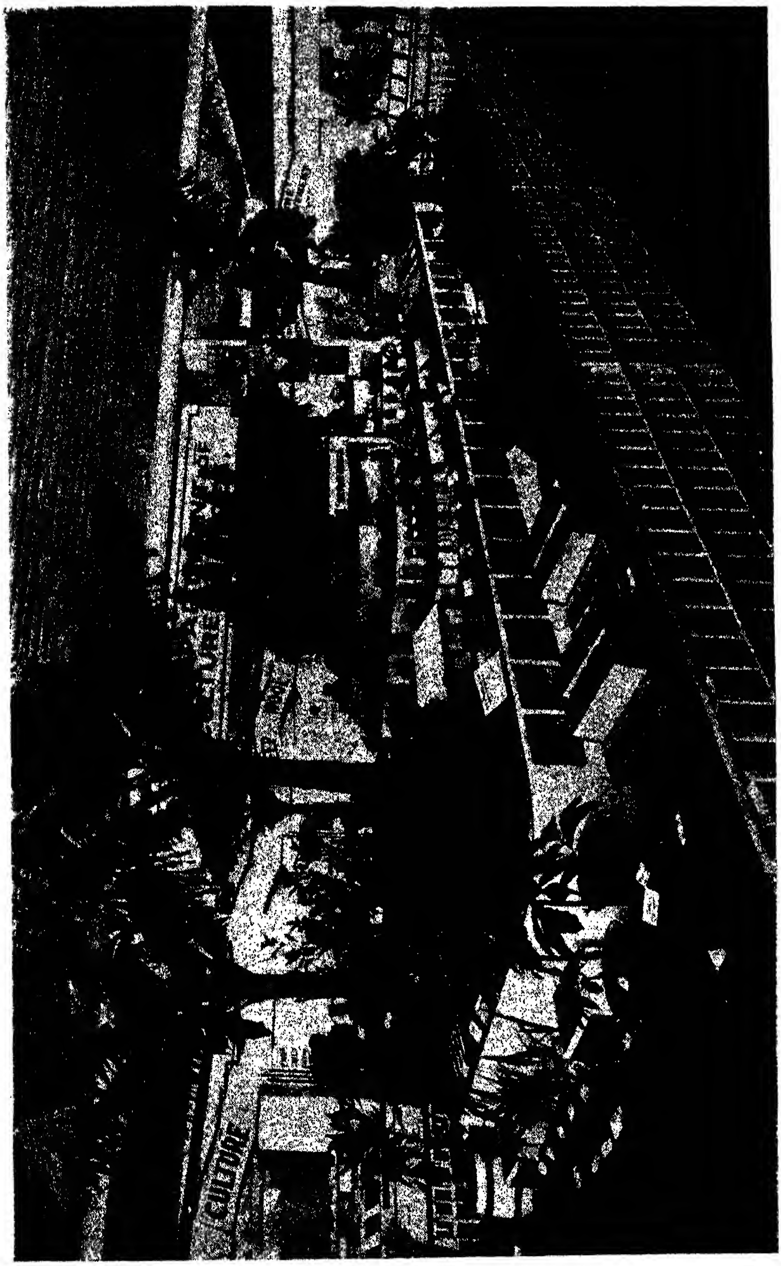


Plate 100.

This year tropical and temperate fruits in extraordinary variety formed the central feature of the Court of the Department of Agriculture and Stock.

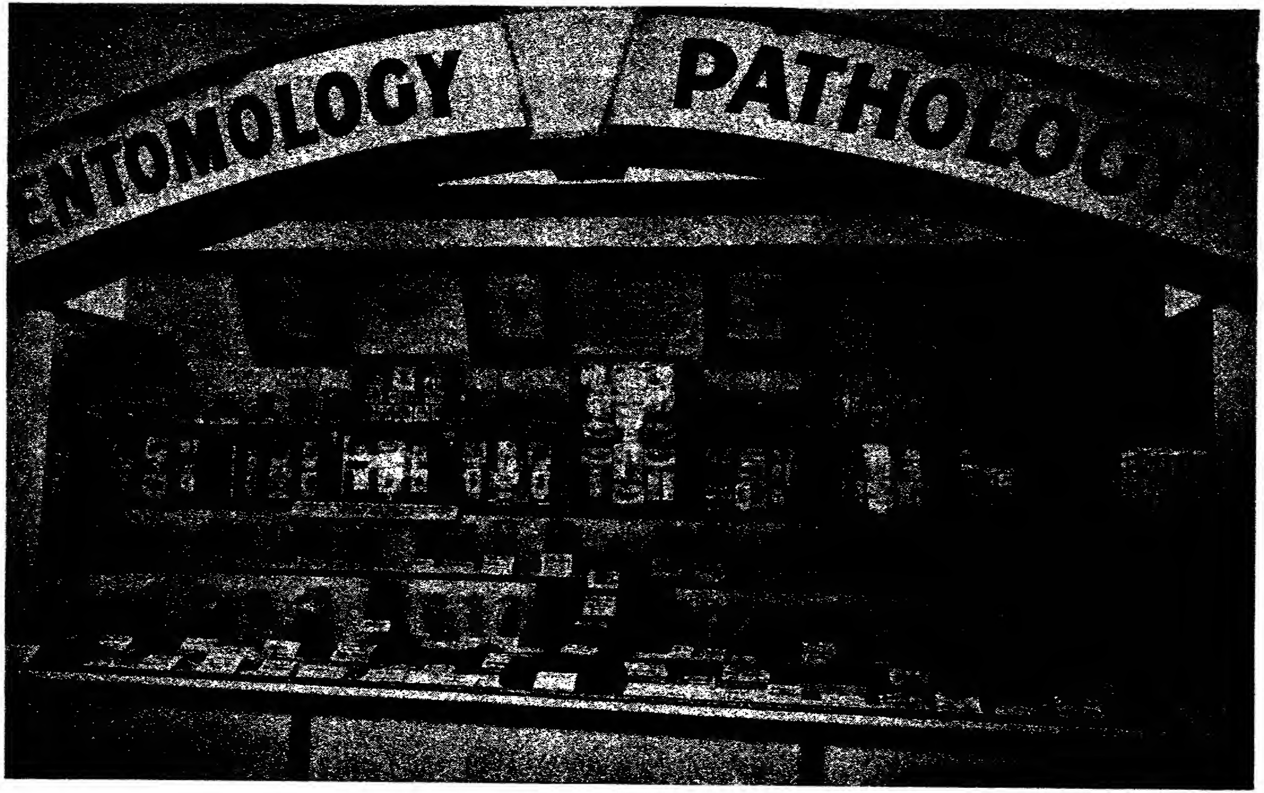


Plate 101.

The importance of entomology and vegetable pathology in rural economy was illustrated impressively in this educational display in the Court of the Department of Agriculture and Stock.

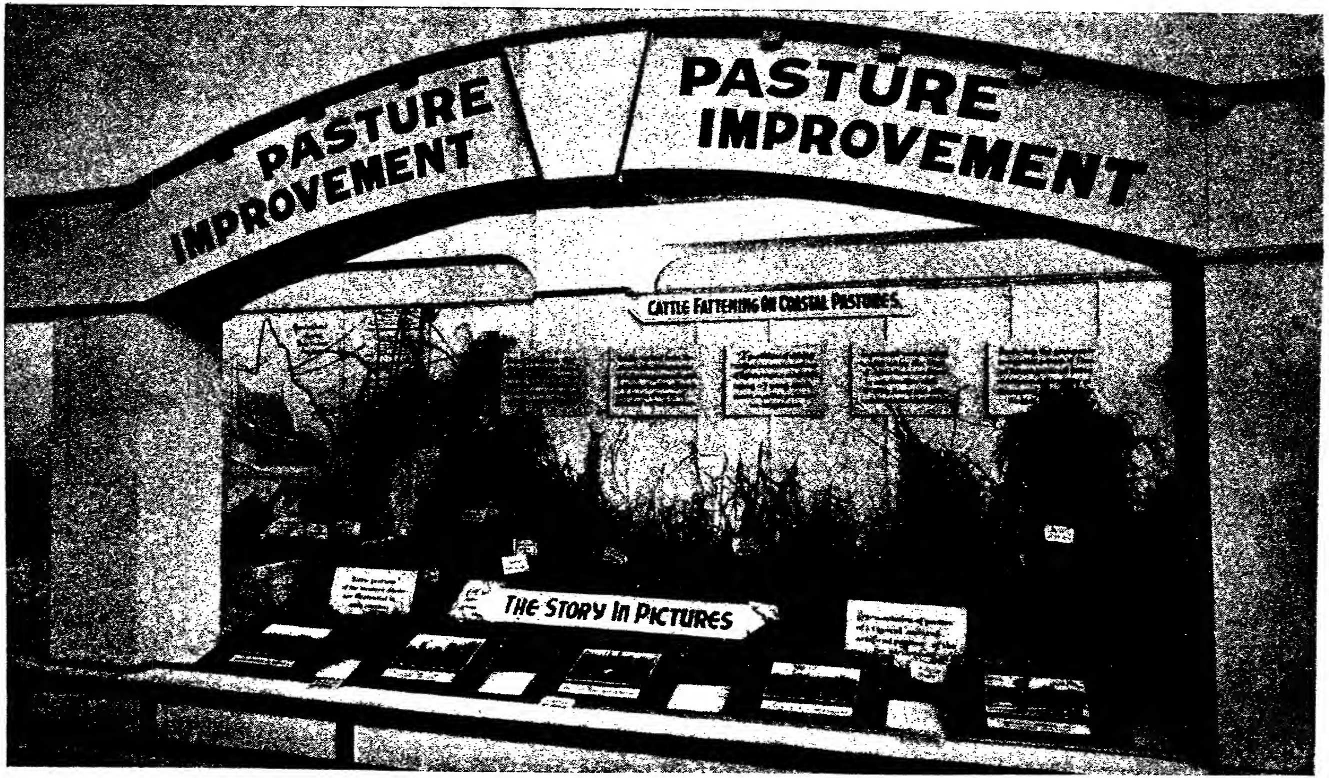


Plate 102.

How cattle may be fattened on coastal pastures was the pictorial story in this popular bay in the Court of Agriculture. Many specimens of indigenous and introduced grasses were exhibited. The renovation of established swards was the main theme of the display.

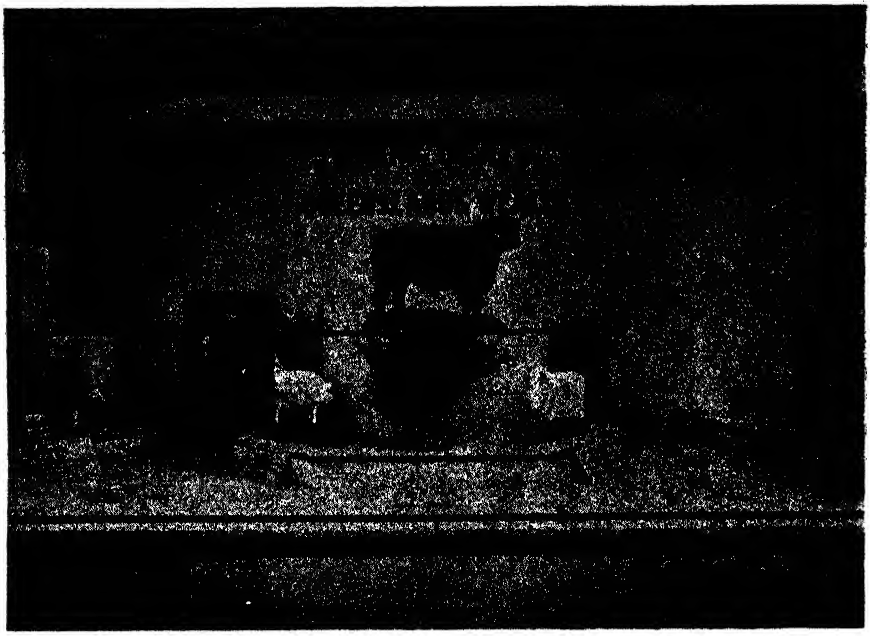


Plate 103.
Modern methods of control and treatment of stock diseases were illustrated in diagram, text, and specimen in this corner of the Departmental Court.

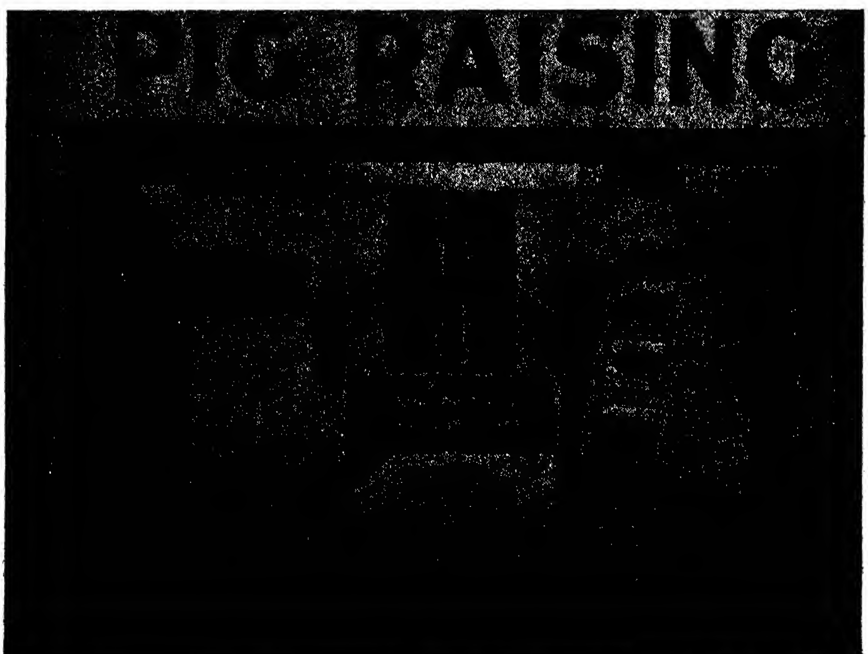


Plate 104.
Points for Pig Raisers.

Plate 105.

This exhibit was arranged in such a way that the fundamentals of fodder conservation could be understood and appreciated at a glance. Scale models of silos—tower, trench, and pit—and samples of silage made with maize, wheat, sorghum, and barley were the chief features of a very fine display. The lesson conveyed was that "a silo contains more good things pointing to greater profits than any other building on a farm."

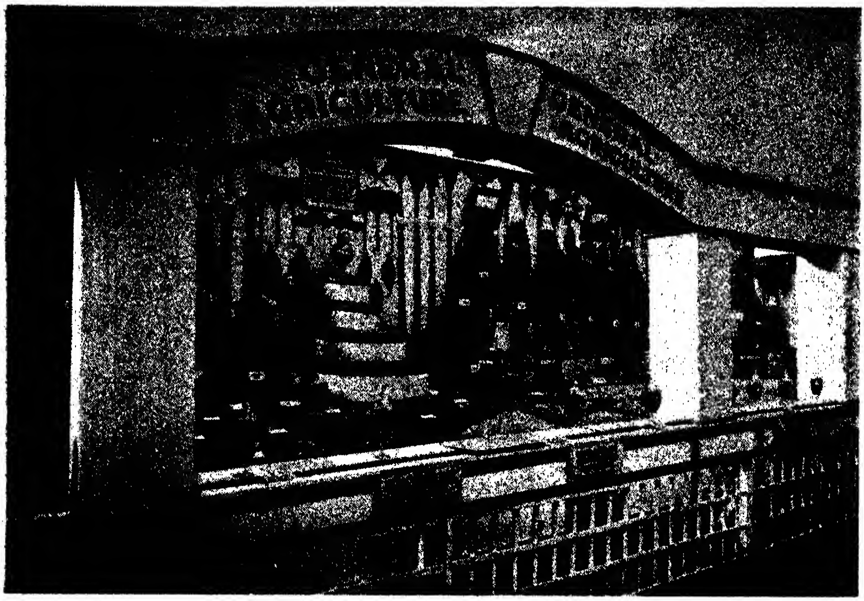


Plate 106.

This collection of farm crop samples—especially of wheat and maize—was an outstanding feature of the Departmental Court.

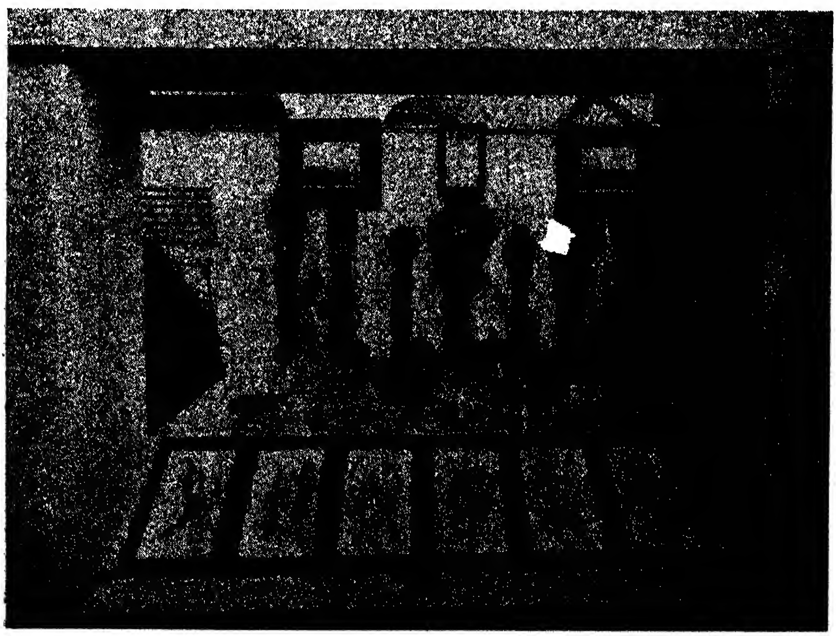


Plate 107.

A PANEL IN THE PASTURE SECTION.—In the foreground were specimens of plants poisonous to stock, which enhanced the educative value of the exhibit.

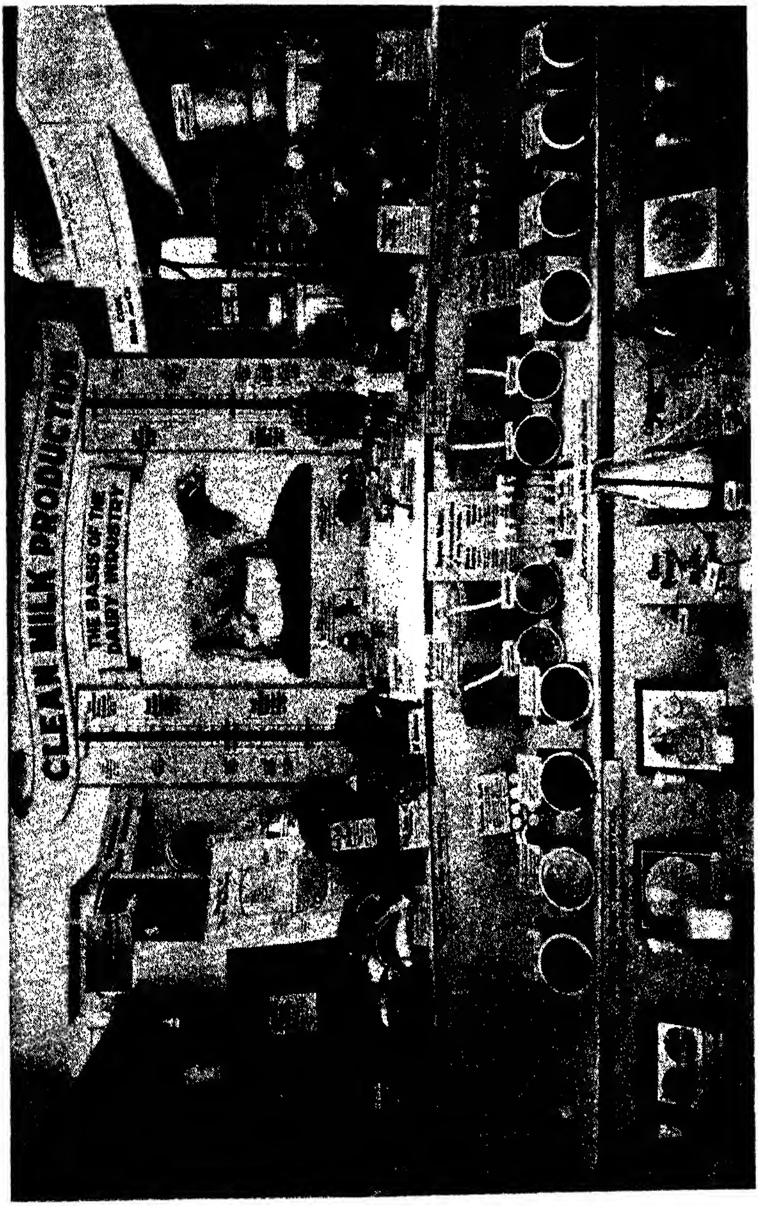


Plate 108.

"Do's" and "Don'ts" in dairy practice and cream-can contrasts were illustrated well and demonstrated very effectively in this outstanding contribution to dairy education in the Court of the Department of Agriculture and Stock.

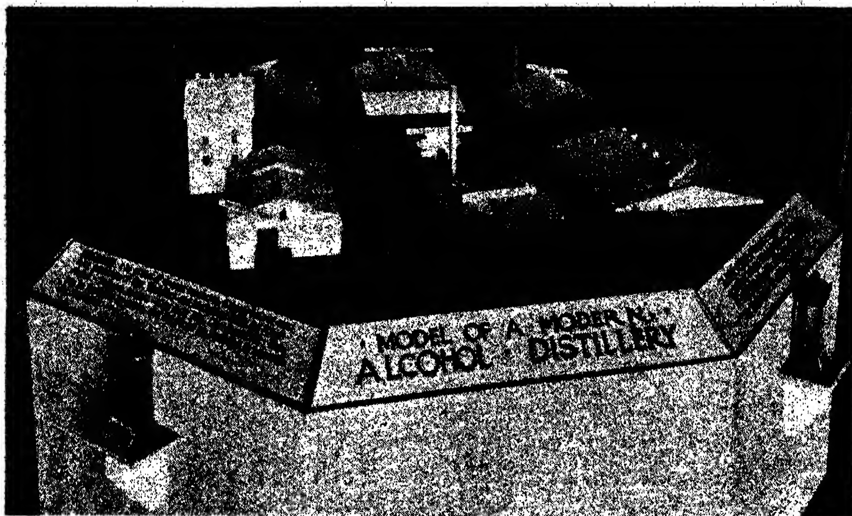


Plate 109.

This model distillery in the Sugar Hall illustrated the development of power alcohol production in Queensland. It showed how a modern distillery is designed to produce alcohol for all purposes. Successive steps in the fermentation and distilling processes were described in detail, and samples of spirit in its various forms at intermediate stages were shown.

Plate 110.

Rhodes grass swards, wherever practicable, should be renewed at frequent intervals. The advantage of this practice was shown in this section of the Departmental Court. The sods in the upper left-hand corner included one showing first year's growth—green, tall, and succulent. A sod of second-year growth was tall and still dense, but rather spindly. A sod five years old was low, thin, and wasty. Productivity, nutritive value, and palatability of Rhodes grass decrease with the ageing of the stand.

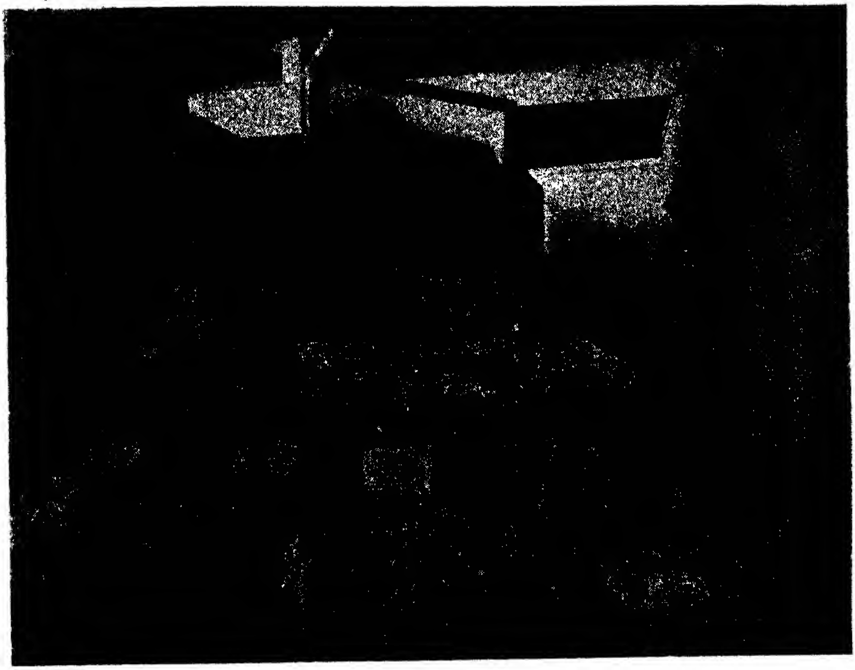


Plate 111.
Merino and Cross-bred fleeces represented Queensland's wealth in wool.

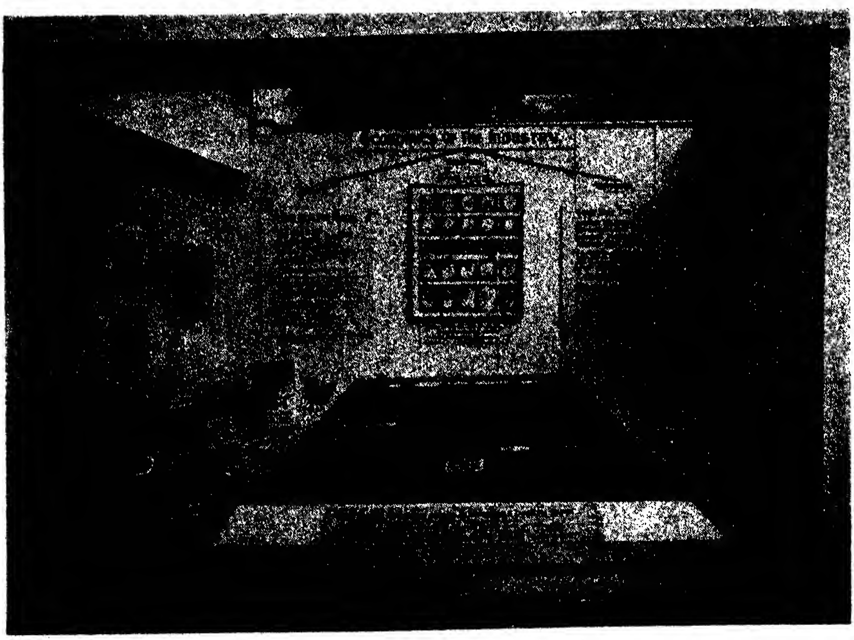


Plate 112.
A scale model poultry farm was a popular exhibit.

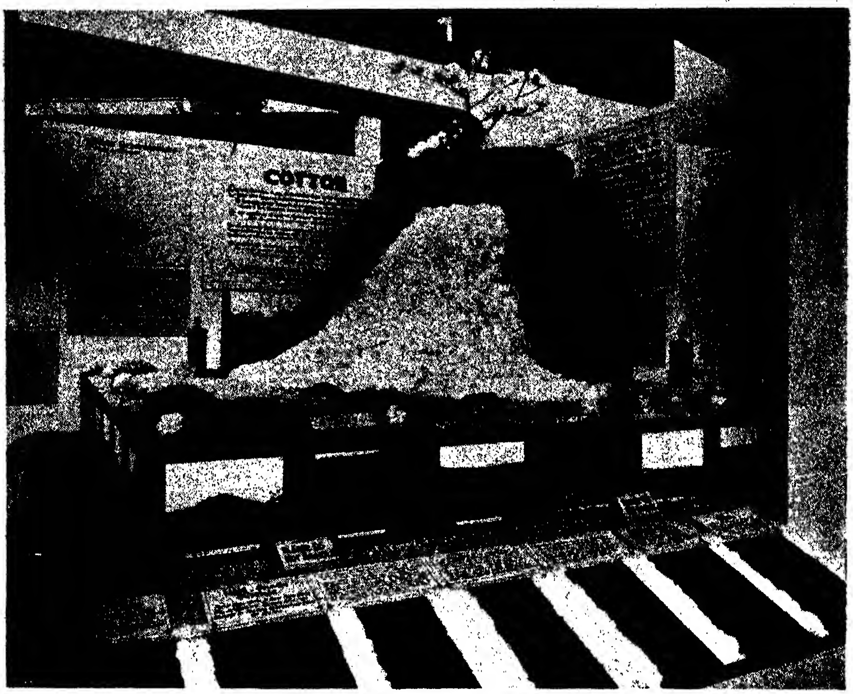


Plate 113.

A fleecy cascade of snow-white lint, backed by baled cotton, was the central feature of the Cotton Alcove in the Departmental Court. By-products in impressive array also demonstrated the value of the cotton industry to Queensland. Cultural practices were also typified, and models of eroded fields provided an excellent object lesson on the importance of soil conservation.

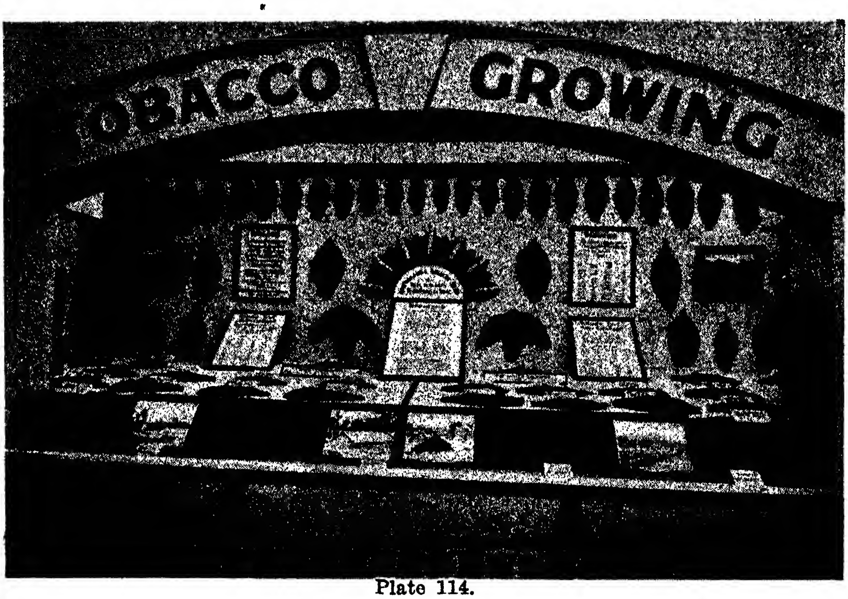


Plate 114.

Queensland tobacco in leaf and bale and commercial grades of high quality attracted the keen interest of visitors to the Agricultural Court.

Plate 115.
"The Pick of the Pack."

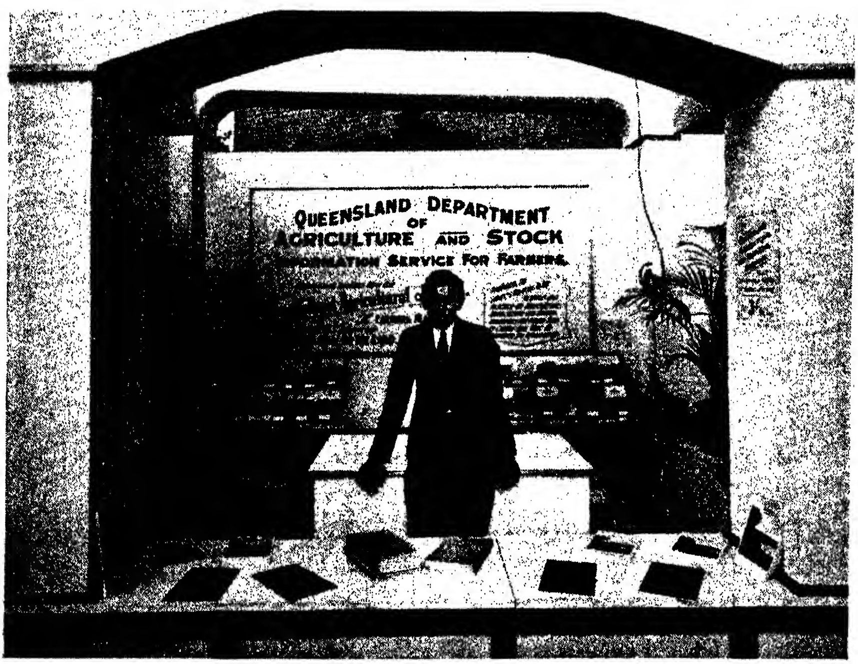
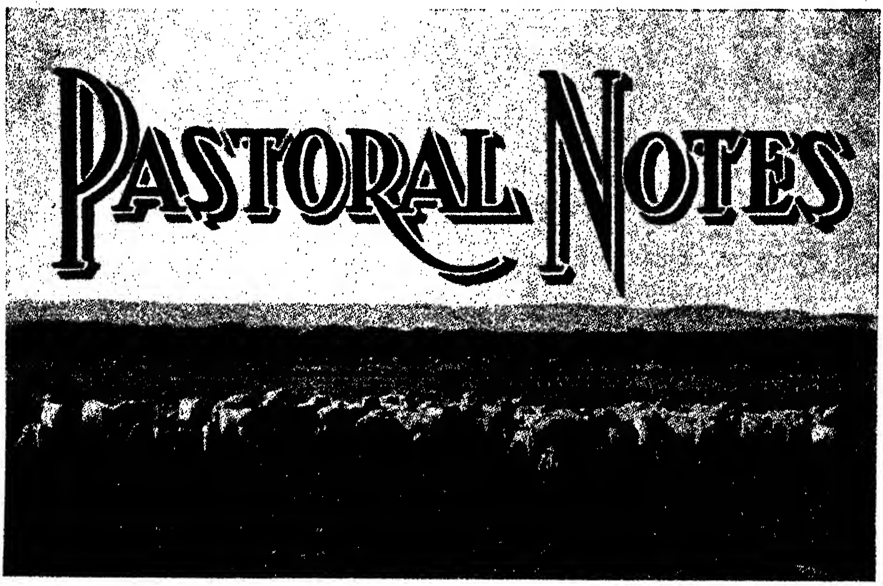


Plate 116.
A clearing house for Departmental information. The "Journal" alcove at the Show, with Mr. Colin Burns in charge. Officers representing every branch of the Department of Agriculture and Stock were in daily attendance to explain exhibits to Show visitors.



Bloat in Cattle.

A. F. S. OHMAN, M.V.Sc.

RECENTLY, numerous reports have been received from dairymen on the Darling Downs respecting the condition of tympanites or bloat. The condition is brought about by the excessive ingestion of easily fermenting foods, e.g., clover, lucerne, peas, and quickly-growing cereal crops.

Symptoms.

Back arched, colic pains, head turned towards flank, kicking at belly, switching of tail, groaning, lying down and getting up, belching of offensive gases and sometimes vomiting. Defecation is at first normal, followed by constipation. Respiration is accelerated, lactation diminished and the animal may show a staggering gait with a definite weakness of the hind limbs. It may appear to be suffocating.

The abdomen becomes enlarged especially on the left side and this "ballooning" may become serious enough to even burst if the animal is not given attention.

Tapping of the swelling with the fingers causes a drum-like hollow sound.

Treatment.

1. Remove the animals from the succulent feed. (Under present seasonal conditions this may not be possible.)

2. Give the following drench immediately symptoms are shown:—

Aromatic spirits of ammonia	$1\frac{1}{2}$ oz.
Sweet spirits of nitre	$1\frac{1}{2}$ oz.
Water (warm)	1 pint.

An effort should be made to elevate the forequarters. By this means the gastric or lower portion of the oesophagus (gullet) is brought above the gases and food thus giving the gases a better chance of escape.

3. In severe cases it may be necessary to tap the abdomen with trocar and canula or, in the absence of these instruments, a sharp knife. Tapping of the abdomen is always done on the left side and at a point midway between the last rib and the hip bone. In short, it is at the highest point of the swelling. The accumulated gases should be liberated slowly, otherwise collapse may occur.

LICE INFESTATION OF CATTLE.

A heavy lice infestation of all classes of cattle, particularly dairy cows, has become a serious matter to stockowners in parts of Central Queensland. The lice—the long-nosed sucking louse and the short-nosed sucking louse—usually make their appearance on cattle in the winter months, becoming most active in the spring when the warm weather sets in.

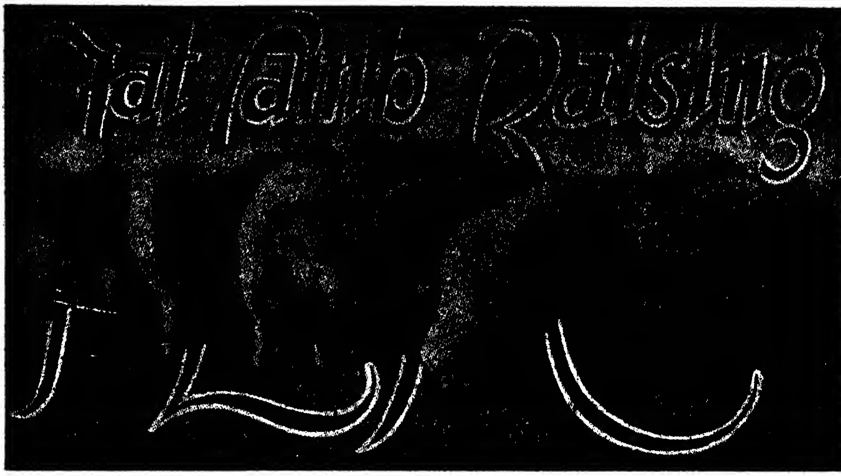
The presence of lice on cattle is indicated by ceaseless skin irritation. In their efforts to ease this irritation, the cattle rub themselves against fences, stumps, and trees and soon become almost denuded of hair on the neck, dewlap, and rump. Whole patches of skin become raw from rubbing; other parts of the animal also become affected.

The ordinary arsenic and soda dip is ineffective against the lice, but if three-quarters of a gallon of crude cresylic acid is added to every 400 gallons of dipping fluid, good results will be obtained. For the treatment of dairy cattle and stud bulls by spraying, a solution of one ounce—two tablespoonsful—of nicotine sulphate solution (40 per cent. or thereabouts) in six gallons of water has proved effective. In either case, the treatment must be repeated in fourteen days in order to destroy the pest. The reason for this is that the first treatment only kills the lice actually alive on the cattle at the time, and will not destroy the small eggs which are attached to the hair of the animals. Within fourteen days all these eggs will have hatched and the young lice will soon be capable of laying eggs, and so continuing the cycle. For treatment to be effective it is, therefore, most important that a second dipping or spraying should be done not later than fourteen days after the first treatment.

Cattlemen who are at present troubled with lice in their cattle will be well repaid if treatment on these lines is carried out as soon as practicable.

QUEENSLAND'S BUTTER CHEQUE.

Queensland's butter cheque for the 1937-38 season—that is, for the year ended on 30th June last—was more than two and a quarter million pounds (£2,250,000) bigger than during the previous season. Production for the year was about 2,000,000 boxes, worth about seven million pounds (£7,000,000), as against 1,507,494 boxes worth £4,761,915 last year.



Worms in Sheep.

IN recent times, the problem of control of the parasitic worms in sheep has claimed attention in different parts of the world, more especially in South Africa, Great Britain, and Australia. Previously, drug treatment was successful only in the case of the stomach worm. Worms inhabiting the small intestine, e.g., the hair worms, and the large bowel, e.g., the nodule worm, were practically unaffected by drugs given in the ordinary way through the mouth. This was due to the fact that, under the conditions usually accompanying treatment, the drug passed into the first stomach or paunch and thus became diluted to such a degree that, by the time it passed through the three remaining stomachs of the sheep, it reached the small intestine in too weak a concentration to be in any way effective against the worms situated there or lower down in the gut.

The process of swallowing in sheep is governed by a groove which passes from the gullet along the roof of the first and second stomachs and eventually into the fourth stomach, which then leads directly into the small intestine. When the sheep grazes, the food is passed directly into the paunch, to be later brought back into the mouth, chewed as a cud, and then swallowed again. This time, however, the groove closes and the thoroughly masticated food goes direct to the third stomach or bible and then is passed on with little delay into the fourth stomach. When the sheep drinks, the groove is again closed and the water passes almost directly into the fourth stomach. It was therefore considered that if some way could be found of getting this groove to close during treatment, the drug would pass directly into the fourth stomach and would reach the worms in the small intestine and large bowel in a sufficiently high concentration to kill most of them.

After a large number of experiments, copper sulphate was found to produce this effect. Various strengths from 1 per cent. to 10 per cent. were tried, and it was found that a very small quantity of a 5-10 per cent. solution gave very consistent results. This work was carried out simultaneously in Australia and South Africa. For the small hair

worms, nicotine sulphate was then combined with the copper sulphate, with very excellent results. This drench was found to be effective against both stomach worms and tape worms. Another point which was brought out by this was that starvation before drenching was not desirable. It was previously considered that by a starvation period prior to drenching, the locality in which the worms were present would be rendered free of ingested food and better contact of the drug with the worms would be given. It was subsequently found that this was more likely to be achieved without starvation, for with starvation the animals brought up the food from the first stomach, ruminated it, and then swallowed it, thus surrounding the worms in the third and fourth stomachs and in the small intestine with the ingested material. Details of this treatment may be obtained on application to the Animal Health Station.

—*Dr. F. H. S. Roberts.*

SKIRTING THE FLEECE.

Probably the greatest defect in the get-up of small clips for market is faulty skirting. The usual mistake is to take too much off the fleece. Every pound skirted off the fleece unnecessarily means a loss in money equivalent to the difference between the prices received for fleece wool and for pieces and broken wool. On the other hand, a loss is sustained if a clip is not skirted properly. If it is payable to "free" a wool it should be done. This consists of removing all burr and other vegetable matter from the fleece. If, however, the fleece is so matted with burr or grass seed that it is impossible to "free" the wool, skirting should be very light, and the wool put up and offered for sale as a "burry" or "seedy" line.

An appreciation of these points may mean substantially enhanced returns to the farmer.

—*J. L. Hodge.*

TRUCKING FAT LAMBS.

Complaints of the bruising of lambs consigned to market are not uncommon, but to a great extent the remedy lies in the hands of growers.

The tenderness of sucker lambs is often not appreciated sufficiently, and in many cases they are handled like fat sheep. Sheep, too, may be bruised by bad handling, although not so badly as sucker lambs. It should be remembered that true sucker lambs have never been off the mothers. It is advised, therefore, that if a road journey has to be undertaken, some of the ewes should accompany the lambs to the trucking yards. A lamb should never be lifted by the skin. Prodding sticks should never be used. Overcrowding in the trucks should be avoided entirely. In all cases, every endeavour should be made to deliver the lambs at the market with the bloom on them. A certain loss in weight and appearance is unavoidable on a long journey, but if the foregoing rules were observed strictly, complaints of bruising would be rare.

—*Jas. Carew.*

SHEEP NASAL FLY.

During the spring and summer, graziers in many parts of the State may be puzzled for an explanation as to why their sheep, for no apparent reason, suddenly gallop round the paddock, or stand in bunches with their faces buried in each other's wool, or held very closely to the ground. If such a group is watched closely, the attitude of the animals will be seen to be due to the presence of a stout, greyish fly, which is to be seen frequently at this time of the year resting on the fly screens and water tanks around the homestead. This is the sheep nasal fly, which lays its maggots on the edges of the nostrils of the sheep. The action of the animals in burying their noses in the wool of other sheep, or in the soil, in an endeavour to protect them from the flies, is easily understandable.

The maggots, after they have been laid by the female fly, crawl up the sheep's nostrils and into the communicating cavities. Here they remain for several months. Being provided with a pair of stout hooks in the region of the mouth, they attach themselves to the lining of the sheep's nostrils and cause the secretion of much pus-charged mucous, on which they feed. The condition in sheep known as "snotty nose" is caused by the presence of these maggots, which also may be responsible for such a severe irritation that the infested animal loses condition.

Control of the sheep nasal fly is not very effective at present, but much good can be done by daubing the animals' noses at frequent intervals with Stockholm tar. This procedure should be especially carried out between October and January, inclusive, when the flies are most numerous.

—*Dr. F. H. S. Roberts.*

THE AGES OF SHEEP.

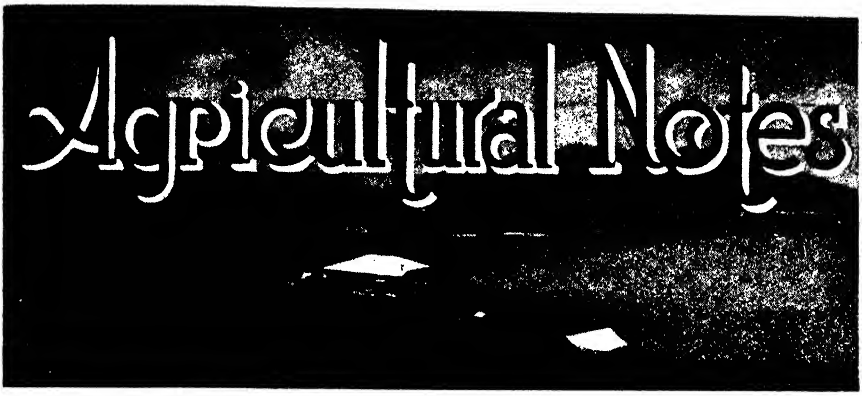
Questions on the ages of sheep and how to tell them are frequently asked. It is a matter of dentition, and, although teeth indications of age are not strictly accurate, they are usually close enough for all practical purposes. Thus a lamb has all temporary incisors or sucking teeth. At about thirteen to fifteen months of age, the two permanent incisors appear. The sheep is then called a "two-tooth." At from eighteen months to twenty-four months, two more permanent teeth appear—one on either side of the original permanence. The animal is then known as a "four-tooth." At the age of 30 months to 36 months, the four permanent incisors are added to again, one on either side, and the sheep becomes a "six-tooth." After a sheep becomes 42 months of age and up to 48 months, yet another pair of permanent incisors make their appearance on the outside of those already there. The sheep is then referred to as "full mouth."

It may be thought that the intervals given of the teeth's appearance are elastic, but this cannot be avoided as so much depends on the country and the state of the pastures.

After forty-eight months, a sheep is referred to as "aged," and the correct age can be indicated only by the soundness or otherwise of the mouth.

A GOOD SHEARING PERFORMANCE.

An excellent performance was put up by a team of shearers at Alice Downs, near Barcaldine, last month. The team numbered twelve, including a learner, and they shore 2,479 big weaners, carrying eight months' wool, in a day, thus averaging 206 a man. The top tally was made by J. H. Edwards with 262. (That sounds like a Bradman or Hutton score.) F. Cooley was the runner-up with 248. P. Moran was third with 233, while the learner had the remarkable tally for a novice of 111.



Nut Grass Eradication.

NUT grass is a weed found in all cane areas of the State; in some districts it is limited in its distribution, while in others it is widespread. In the sense that economic crops and weeds cannot thrive in the same land, nut grass must be regarded as a pest, though farmers are by no means unanimous that it does any serious injury to their cane crops, even where the land is heavily loaded with "nuts."

Attempts have been made from time to time to control nut grass, and the best means employed to date is the growing of a crop which will smother the grass. Lucerne and pasture crops are examples. But no satisfactory method has yet been devised for land under cultivated crops.

Farmers will doubtless be interested in the results of an experiment which is reported from the United States of America, and in which an attempt has been made to eliminate the weed by *frequent cultivation*. The object was to break apart the tubers and expose them to drying at or near the surface of the soil. Other tubers would be stimulated to germinate, in the moist soil; apparently this takes place only when the individual tubers are broken away from the general plant system. It was further shown, in the particular sandy soil studies, that less than 1 per cent. of the "living" tubers were below plough depth.

Separate plots were selected, and various treatments were tested Both ploughing with a mouldboard plough (which inverted the slices and facilitated drying out) and harrowing with discs, were employed. The implement used in the latter treatment consisted of 10 discs, each 16 inches in diameter, and the plots were treated twice at each working. Ploughings or discings were made at 1-, 2-, and 4-week intervals from June to October. On other plots, the treatments were made whenever sprouts were general over the area. The average interval in these cases was about three weeks, and operations were continued from April to October.

The results show that over a period of two years, nut grass was either completely eradicated or very nearly so on all plots except those which were disced every four weeks. The infestation was reduced by about 80 per cent. in the first season. Further trials at a later date

showed that by ploughing at three-week intervals, over two consecutive seasons, the nut grass was completely eliminated.

It is therefore concluded by the authors that nut grass can be eradicated from sandy soils by the method employed. It is suggested that the method is particularly practicable when small areas of nut grass occur in a field, though it may not be applicable on a farm-wide scale.

Before anticipating similar success under Queensland conditions, it must be borne in mind that the soil type under consideration is important. These experiments were made on light sandy soils, which dry out rapidly. This is an essential feature of the project. Furthermore, the proportion of winter killing of the young nuts which persisted after the first season could not be expected in Queensland; but at least the results are interesting, and the scheme is worthy of trial under selected conditions.

—H. W. K., in The Cane Growers' Quarterly Bulletin for July.

FARM GATES.

On every farm there is always a lot of maintenance work to be done, such as fencing repairs, the making and hanging of gates, the painting of buildings, and the overhauling of machinery, implements, and harness. Some of these jobs can be done during dry weather, and others are better reserved for rainy days.

It is advisable to give attention to the outside jobs first, and, of these, the erection and repair of gates is important. It is surprising to find so many makeshift gates on the farm when strong light gates can be made or bought at very reasonable prices.

Of the different types on the market, the wooden gates are the best, as those having a steel pipe frame, if once bent out of shape, are difficult to straighten, whereas a broken rail or two can readily be replaced. The self-opening types are favoured by some farmers, but these are more expensive and more liable to get out of order than the simpler kind.

Gates should always be swung on good heavy posts placed 4 feet in the ground, with a sill log in between. The hinges, which should be strong, are generally placed in a vertical line. Occasionally it is desirable that the foot of a gate should lift when opened, and this can be arranged by placing the lower hinge half an inch off the plumb in the opening direction.

The materials required to make a double five-barred bolted gate for a 12-foot opening without any morticing are—

112 running feet of 3-inch by 1-inch or 4-inch by 1-inch timber;

3 lb. of $3\frac{1}{2}$-inch by $\frac{3}{8}$-inch bolts and washers;

2 pairs hook and eye hinges 2 feet by 2-inch by 5/16-inch.

Butts and heads should be cut 4 feet long, and should be double —that is, placed on each side of the bars. The bottom of the first rail should be 3 inches from the bottom of the upright. The distance between the first and second rails should be 6 inches; between second and third, 6 inches; between third and fourth, 7 inches; and between fourth and

fifth, 8 inches. There should be two double stays on either side of rails on each gate running from the bottom of the butt to the top of the head.

When hinges are being placed in position small pieces of 3-inch by 1-inch timber should be inserted against the rails for packing purposes. A sliding piece of 3-inch by 1-inch timber along the third rail between the stay and the head makes an excellent fastener.

Gates are not finished until they have been painted, and if the first two coats are given before the gates are put together, the job will be easier and considerable time will be saved.

—*R. E. Soutter.*

THE SWEET POTATO—A VALUABLE CROP.

The sweet potato is not cultivated in Queensland to-day to the extent that its usefulness warrants. At one time it was used largely on the householder's table, but now it is a rarity.

When questioned about the shortage of sweet potatoes for table use, the farmer usually replies, "There is no demand for them." This is true only in part, but the demand still exists for the right varieties. A dry floury, or a moderately moist, potato will suit the consumer best. No doubt, some of the good varieties in use in the past are not now available, owing to droughts and irregular planting, but many are still to be found in certain localities. If the planting is confined to varieties which have proved popular with the consumer, and which could be sold on name, the demand for them should be continuous. Under present conditions a householder may buy sweet potatoes which are unpalatable. If, however, consumers realised that there were different types and varieties of sweet potatoes, they would learn very soon to purchase only types which they liked.

Market gardeners should, therefore, cultivate varieties for which they could readily find buyers. Some market gardeners are already doing this with good results. Very watery or stringy varieties are both undesirable. It is a mistake for a grower to allow a portion of his crop to stand over after maturing, as the tubers then begin to deteriorate in quality.

Sweet potatoes are easy to grow, and can be raised on a variety of soils, the period of growth from planting to harvesting being approximately three months. The period of planting is dependent very largely on the locality; in most parts along the coast it may extend from October until the end of February. The crop must mature before the frost commences. The crop does not require a big rainfall—in fact, excessive moisture is detrimental to good results, in that it increases the growth of vines, and lessens the crops of tubers.

The most satisfactory method is to plant a few medium-sized tubers in a nursery bed of good friable soil, which is mulched in order to retain moisture and promote rapid growth, and to pick cuttings as growth progresses. A bed of fifty selected tubers planted in this way will provide many thousands of cuttings. The alternative, and less satisfactory, method of obtaining planting material is to procure cuttings from an old plot, which is usually neglected. The terminal cutting from the vine is generally regarded as giving the best results. The land is set up in ridges 3 feet apart. The cuttings should be 12 to 15 inches in

length, and planted on the ridge to a depth of approximately 6 inches, cuttings to be set from 20 to 24 inches apart. On well-prepared soil weeds should not be troublesome, and little attention will be necessary until harvesting.

A good crop of sweet potatoes will yield 20 tons of tubers to the acre. Several of the old varieties were known by different names in various districts. A classification of all varieties grown in Australia was carried out in recent years by an officer of the Department of Agriculture and Stock, and cuttings of a known type, together with a number of new seedling varieties, were distributed in different agricultural districts of the State. Some recommend varieties for planting for table use are Gold Coin, Seedling No. 3, Brook's Gem, and Snow Queen.

It is advantageous to the grower to market the tubers in a clean and attractive condition.

—*W. Goodchild*

PLANTING OF GRASS CUTTINGS.

Grasses which are propagated commonly by means of stem cuttings, plantlets, or crown divisions, include Kikuyu grass, Para grass, couch grass, elephant grass, and Guinea grass. In special circumstances, the planting of vegetative material of the grasses mentioned may be carried out on rough country and on timbered land with some prospects of successful establishment; but, wherever possible, well-worked land should be provided.

Where stem cuttings are used, these should be cut with a knife, shears, or chaff-cutter into lengths, each containing at least two nodes or joints. If abundant material is available, it is advisable to allow several nodes to each cutting. The cuttings may be laid flat in shallow furrows and covered or placed vertically so that one or more nodes are buried and the remainder are above the surface. The soil should be well firmed about the cuttings. The cuttings shoot and root at the buried nodes and also form shoots at the other joints.

If plantlets or crown pieces are being planted, the best method is to set them out in holes in lines across the paddock. The holes are made with a hoe, the tool being used with its head at right angles to the line. When planting, the planter works along the line, places the plant against the hard far edge of the hole, fills up the hole, and compacts the soil with all his weight on his right foot, while putting in the next plant. To avoid setting the plants too deeply, the tuft should be held from above, but close to the crown, so that the knuckles of the hand are on top of the ground when the plant is being set.

—*C. W. Winders.*

SUDAN GRASS IN THE MARANOA.

Sudan grass is outstanding as a hay and grazing crop for the drier farming areas, as is indicated by its popularity on the Darling Downs and in the Maranoa district. Lack of harvesting machinery and implements, such as the reaper and binder, or mower and rake, on many stock farms, is often the retarding factor so far as the conservation of hay is concerned.

With the more extensive use of blue panic and Rhodes grass, the conservation of Sudan grass as hay and silage, and the more widespread utilisation of winter fodders, such as wheat and barley, it should be possible to carry on dairying in the drier country away from the coast right through the winter, even in the Maranoa. At present many dairy farmers in those regions dry the cows off during the autumn, and may not milk again until the spring.

In recommending Sudan grass as a grazing crop, the risk of fatalities as a result of hydrocyanic acid poisoning must be kept in mind. By taking reasonable precautions in feeding, many farmers have utilised Sudan grass in all stages of growth as a grazing crop without ill effects. An effort should be made to procure pure seed, free from admixture with sorghum or Johnson grass hybrids. Full information regarding the cultivation of Sudan grass can be obtained from the Department of Agriculture and Stock, Brisbane.

—*H. W. Ball.*

OVERHAUL OF HARVESTING MACHINERY.

Now is the time for a complete overhaul of the harvesting plant. Modern farm machinery is usually complicated, with many different yet inter-dependent working parts which require close attention, in order to ensure mechanical efficiency when it is brought into use in the field.

A breakdown at harvest time must be avoided as far as humanly possible. A detailed inspection of every part of the machinery before commencing operations is, therefore, essential. All loose bolts should be tightened, broken or worn parts replaced, bearing packed and adjusted where required, pulleys aligned, grease cups cleaned and filled, and belting overhauled and oiled. Castor oil is useful for making leather work pliable, besides being a good lubricant for a bearing tending to run hot.

There also should be on hand an assortment of bolts, nuts, spring washers, lubricating oils, and graphite—the latter for mixing with water and painting the sprockets, chain belts and cogs, for which it is far superior to oil.

—*R. E. Soutter.*

PROTECTING ROOFS OF FARM BUILDINGS.

The galvanized iron roofs of all buildings adjacent to the coast will rapidly deteriorate if not specially protected by painting. The usual preparation employed is iron oxide paint. Though this is effective, it cannot be claimed that it is very attractive in appearance after a year or two, while it is well known that the red colour is highly absorbent of the heat rays of the sun.

Recently it was necessary to treat the roofs of the Experiment Station buildings at Bundaberg, Mackay and Meringa, and it was decided to use as a finishing coat, a specially prepared aluminium paint. As an undercoating, to prevent the development of rust spots which had appeared on many of the roofs, a well-known rust-killing primer was first applied. This was followed by one coat of aluminium paint.

The finished job has proven to be entirely satisfactory, and the highly-reflecting silver surface of the roof ensures a minimum of temperature rise under the action of sunshine while the appearance is also attractive. We will be pleased to supply further particulars of preparations and costs on application either to our Station officers or to the Brisbane office.

—*H. W. K., in The Cane Growers' Quarterly Bulletin for July.*

FIJI AND DOWNY MILDEW DISEASES.

Cane planted in the Southern districts in January and February of this year will be showing the symptoms of Fiji and downy mildew diseases where cuttings infected with these diseases have been planted. Although farmers may not be able to recognise either disease with absolute certainty they will be able to see that there is *something* wrong with the stunted stools of Fiji disease or the yellowish stools of downy mildew. If any doubt exists a letter or a telephone message to the nearest Experiment Station will bring an inspector.

Neither Fiji disease nor downy mildew spreads to any appreciable extent at this time of the year. Both these diseases seriously menace P.O.J. 2878 in Southern Queensland and farmers are most strongly urged to go through their young cane *now*, make row inspections and dig out any diseased cane. Only by such attention can P.O.J. 2878 be retained.

In the Mackay district downy mildew, if present, should be commencing to show up in autumn-planted cane. Inspections and digging out of diseased stools should be started now and continued at intervals during the dry spring months.

—*A. F. B., in The Cane Growers' Quarterly Bulletin for July.*

Plate 117.

Some of the Wootha Jersey herd, Maleny, South Queensland.

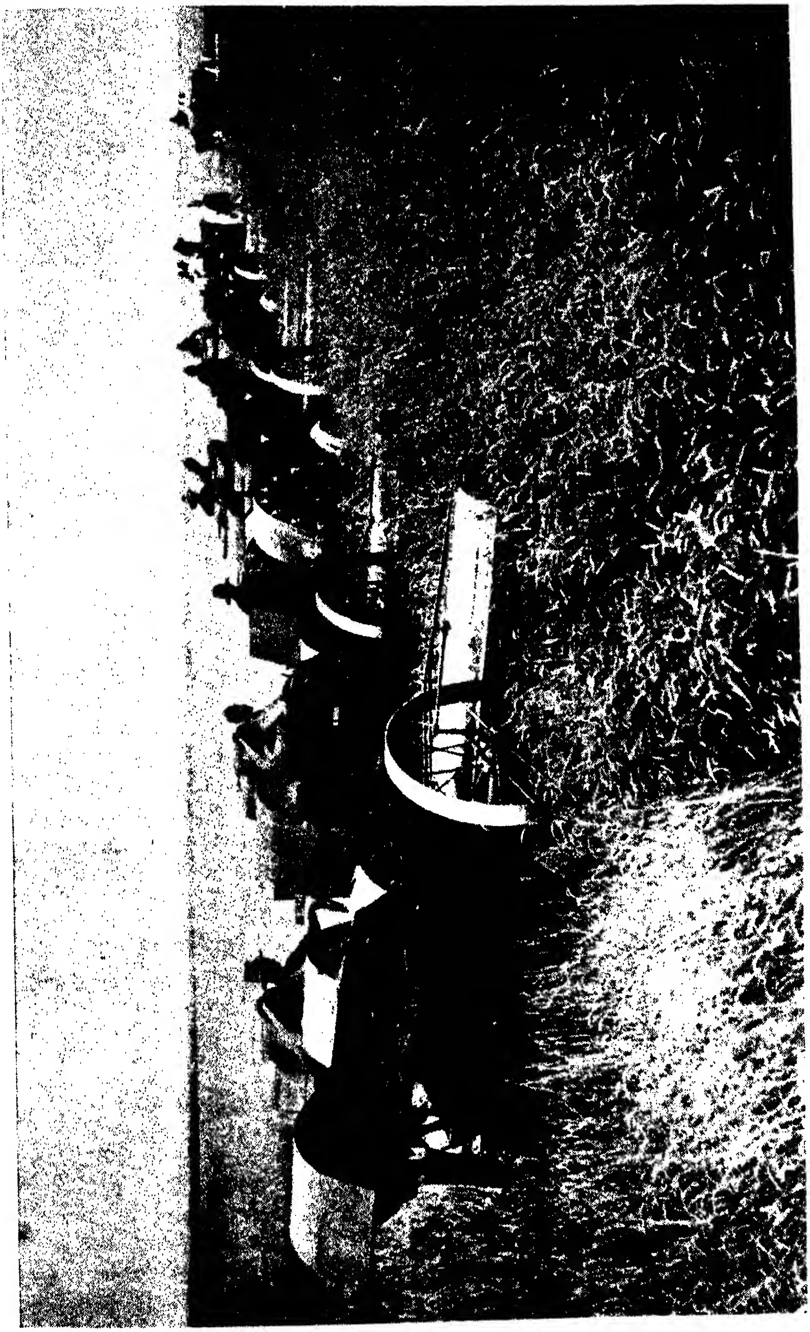


Plate 118.

Australian-made Auto-Header, 12-feet cut, and nine Standard Headers of 8 by 10-feet cut, working in a 10-bushel crop of wheat at Pittsworth, Darling Downs, Queensland.

What is Pasteurisation?

ALTHOUGH the term pasteurisation is very commonly used nowadays, there, perhaps, are many who do not know its origin and meaning. Actually it dates back to 1860-1864 when Louis Pasteur, the famous French scientist, conducted experiments on "diseases" in wine and beer, and found that heating for a short period at a temperature of 140 deg. F. was sufficient to prevent abnormal fermentations and the souring of these beverages. This process of heating liquids to check the growth of undesirable microbes was extended to other industries, and was given the name pasteurisation in honor of Pasteur, who had first employed it.

To-day it is best known through its application to the dairying industry. The pasteurisation of milk simply means that the milk is heated to a temperature of 145 deg. F. for thirty minutes and then cooled as quickly as possible to 50 deg. F. or lower. Cream in the butter factories is heated to 185 deg. F. for a few seconds, and then cooled rapidly to 40 deg. F.

Pasteurisation aims, firstly, at making milk and milk products safe, by destroying any disease germs that may be present; and secondly, at improving the keeping quality of butter and cheese made from milk and cream so treated. It, however, has its limitations. It cannot perform miracles, such as improving the grade of cream from second to choice, or eliminating strong weed taints. Most dairy farmers are now aware of this and know that the production of choice quality cream depends on the care and attention given at the farm, and that the pasteurisation process is beneficial in that a butter of choice quality can be manufactured to withstand long periods of cold storage.

—*O. St. J. Kent.*

A COMMON CREAM TAINT.

On of the more common defects in cream is that which is referred to as "disinfectant flavour."

The cause of this taint, in most cases, is carelessness in the handling of disinfectants before and during milking. The use of dilute solutions of some disinfectants—other than Condy's fluid—for bathing cows' udders and teats before milking also can give a taint to the milk. The cleansing of milking machines and utensils with disinfectants possessing strong odours, is another cause of this taint, which is imparted to the cream, either by absorption of the vapours or direct contact. No amount of aeration or stirring will remove the taint from the milk or cream. For this reason, disinfectant-tainted cream cannot be used with safety, even in the manufacture of pastry butter; consequently, it is rejected at the butter factory as being unfit for human consumption.

To avoid the risk of taint, the following suggestions are offered:—

1. Don't use disinfectants with marked odours.
2. Sore teats should be treated with petroleum jelly or some odourless ointment.
3. Use a solution of washing soda—from 3 to five per cent., say—for cleansing dairy utensils. It removes grease readily and corrects acidity.

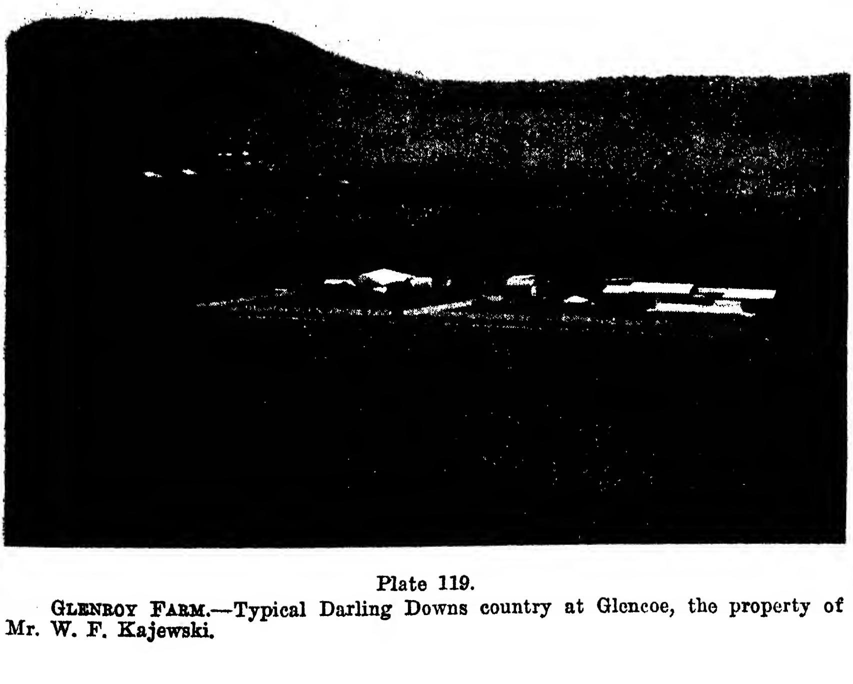


Plate 119.

GLENROY FARM.—Typical Darling Downs country at Glencoe, the property of Mr. W. F. Kajewski.

How to make a Pig Net.

E. J. SHELTON, Senior Instructor in Pig Raising.

WHEN transporting pigs in an open wagon or truck, a net or cover is required. The net illustrated is the type usually recommended for the purpose. It is convenient to use, cheap, durable, and easy to make.

It is not a sunshade, however, and will not protect the pigs from the sun when they are exposed to its direct rays. This suggests the necessity of providing some form of shade or protection, even if it is only a few green bushes or a wet bag or two.

The method of making a pig-net is simple. The materials required are rope and a length of softwood or hardwood board rounded at the edges and 12 to 18 in. long and of the same width at both ends. This piece of board is referred to by net makers as the mesh stick, its principal use being to keep all the meshes the same size. In actual use a mesh stick 2 in. wide will make a 4-in. mesh; a 3-in. stick a 6-in. mesh, &c. The objective is to have the stick half the width of the mesh it is intended the net shall carry.

In measuring the meshes it is necessary to draw them out to a diamond shape. The 4-in. mesh is preferable for bacon or pork pigs, a smaller mesh for suckers and weaners. Where fishermen set out to fashion a fishing net they use a long needle and the cord is held on a reel or short length of timber, but in the case of a pig-net the rope had better first be rolled up in the same way as the ordinary rope clothes-line or sash cord is when purchased; it will then be a simple matter to pass the hank of rope through the loops when making the knots at the corner of each mesh, for the knotting is rapidly performed by an experienced worker.

In setting out to make the net, first tie a loop in one end of the rope as in A, Fig. 1. Place this knot on a strong spike or hook attached to a post or wall or some other convenient place as at A in Fig. 2. Now

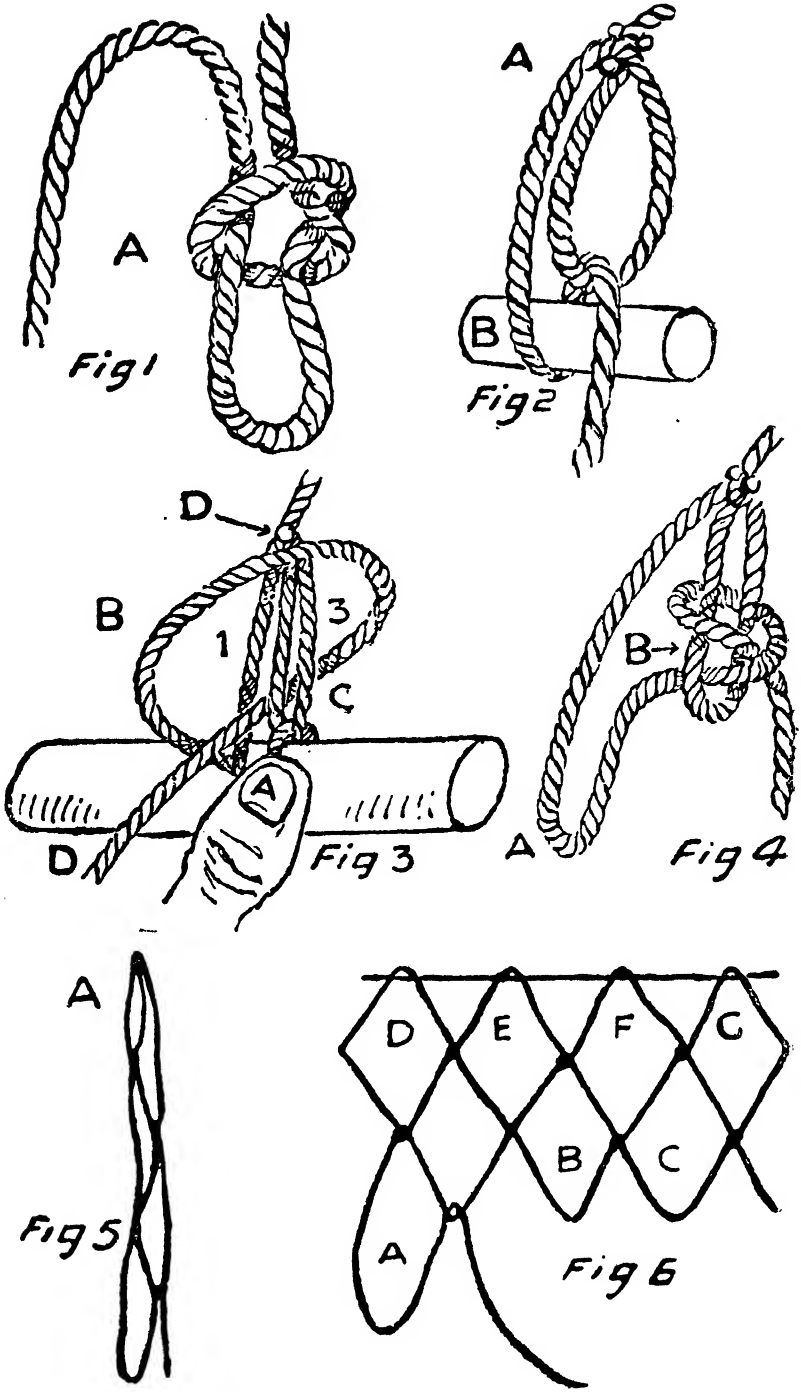


Plate 120.

place the mesh stick under the loop as at B, put the rope around the mesh stick, then pass the rope through the loop and pull rope tight, proceeding to place the thumb of the left hand on the rope beyond the loop as at A in Fig. 3, and with a turn of the wrist of the right hand throw the rope to the position shown at B. Next pass the rope behind the loop C, and then through the bight of B and down as at D; draw knot tight, which should now assume the shape indicated in Fig. 4. This figure shows the knot made loosely to enable the method of making it to be clearly seen and readily understood. The rope must be held firmly with the thumb at A, Fig. 3, when pulling up the knot, as on this depends the uniformity of the shape and size of mesh.

To continue the netting, the stick is withdrawn and placed under A, Fig. 4. The rope is then passed around the stick as in Fig. 2 and brought through the loop A, Fig. 4, and the process shown in Fig. 3 is repeated to form another mesh, this being continued to make a chain of meshes, say, the width of the conveyance to be used when transporting the pigs to rail or sale. The loop A, Figs. 1, 2, and 5, first tied is then untied and it will be found that all the meshes are equal in size. Next, the chain of meshes is opened out at right angles to the line in which it was made, as shown in Fig. 6; in other words, remove the chain of meshes from a vertical position as in Fig. 5 and place them in a horizontal position as in Fig. 6. A line is run through the meshes D. E. F. G. and secured between two posts to hold the net while continuing the meshing. Working across is then begun by making a mesh at A, Fig. 6, then at B, C, and so on until the length of the first lot of meshes has been reached, when the right-hand side of the net is turned around and placed where the left-hand side was and the left-hand side placed where the right-hand side was. Another row of meshes is started on the left-hand side (facing the net) and worked until the one under A has been reached on the right-hand side.

The net is turned again, and another row of meshes commenced on the left-hand side, and so on until there are enough rows of meshes to cover the vehicle. To secure the net to the vehicle use rope plough lines, and reeve them through each mesh and around the side and end rails of the body of cart. The method described herein of making the meshes is the same as is used in making ordinary hammocks.

The net and bags used for shade should be at least 1 ft. above the backs of the pigs, otherwise the net may rub and injure the flesh and blister the skin. Every possible care and attention should be given to see that this does not happen.

In loading, secure the net on both sides and in front, first leaving a good length of plough rein free to tie the net to rail of tailboard when pigs are loaded and vehicle is clear of the loading race.

REARING PIGS WITHOUT THE SOW.

Newly-born pigs are frequently deprived of the sow's care through death or sickness, or because the litter is too large. If taken in hand as soon as they are deprived of the sow's milk, there is a very good chance of the pigs being reared successfully by artificial feeding. If they are left too long without sufficient food, however, they become weakened and difficult to rear.

Sometimes a large litter is divided into two lots, and each lot is put with the sow separately for a drink at frequent regular intervals. Although this entails a lot of attention, it gives satisfactory results. Foster mothers are sometimes available, and a sow with a small litter may be given some pigs from another sow, provided they are about the same age as her own.

When hand feeding is resorted to, the pigs should be given a warm, dry camping place, and have access to clean pasture. A movable shed in the run is very convenient. In the absence of the sow's milk, which helps to build up a natural resistance to disease, every possible precaution should be taken to prevent infection in the young pigs. A clean and comfortable pen should be a first consideration. Access to pasture assures a supply of vitamins and minerals, which are essential to a complete diet.

A method of feeding which has given very good results with pigs taken from the sow when a day or two old is as follows:—Start the pigs on whole cow's milk fed warm and as fresh as possible, six times daily. After three weeks the whole milk may be gradually replaced by separated milk, and the six feeds daily may be gradually reduced to three feeds daily. When the change from whole to separated milk is being made, a trough of a dry meal containing 90 per cent. of pollard, bran, maize-meal or wheatmeal, and about 10 per cent. of meatmeal should be kept in the pen with food always available to the pigs. This trough must be sheltered and kept dry. A constant supply of drinking water should also be kept before the pigs when they are given the dry food.

In teaching the young pigs to drink, the bottle and teat are neither necessary nor desirable—a shallow dish serves the purpose well. The warm milk should be placed in the dish about ½ inch deep and the pigs taken one at a time and stood in the dish. Then, if the pig is held firmly over the top of the neck, its head can be placed down into the milk, and held there long enough for it to get a taste of milk, but not long enough to allow it to inhale the milk. This operation may be repeated a few times at each feeding. After two or three such lessons the piglets will usually drink readily without assistance and afterwards will give little trouble.

When the piglets are drinking well, the dish may be replaced by a shallow trough. Both the dish and the trough used for holding the milk should be made of metal or earthenware and free of cracks so that they can be cleansed and scalded after each meal. This is most important for the prevention of digestive disorders.

—*L. A. Downey.*

LONGER AND LEANER PIGS REQUIRED.

The most important single attribute of a good bacon pig, provided, of course, the pig is in suitable condition and is very fleshy, is length of body. Measurements have shown that at about 120 lb. dressed weight long-bodied pigs possess as thick, if not thicker, streaks of lean meat than short pigs. Lengthy pigs tend to have that leanness throughout which now is in such great demand. Long-bodied pigs have, generally, lighter shoulders than short pigs at the same weight. Undue length, of course, has disadvantages, but not as many as undue shortness, because the

shorter pig always has a tendency to become overfat, while the longer pig carries more lean meat.

The framework of the pig tends to become coarser, and the hams not so fully developed, if the pig is kept growing. There is a tendency also for the flesh to be not so well proportioned throughout the thicker portions of the carcase.

It is false economy to hold pigs until they become overfat.

—*E. J. Shelton.*

Plate 121.

Cascades in the National Park, Lamington Plateau, South Queensland.

The Brown Vegetable Weevil.

DURING the months of July, August, and September mainly, the plants in market and home gardens are liable to attack by a small insect known as the brown vegetable weevil. The plants principally affected are the vegetables, including beetroot, carrot, lettuce, mint, potato, radish, tomato, turnips, and watercress; tobacco seedlings and cineraria have also been recorded as hosts, and among the weeds the insect feeds mainly on the cape weed. Both the larval, or grub stage, and also the adult weevil feed on the plant tissue, while the pupal stage occurs in the soil. The larva, when full grown, is pale green in colour with a brown head, soft bodied, and about half an inch in length. The adult is a small weevil about one-third of an inch long, brownish in colour, usually with a pale, oblique stripe on each wing cover, forming a wide V-shaped mark on the back. The head is produced into a trunk or snout, typical of the weevils.

The adults feed mainly by night, sheltering in the soil during the day, but the grub stage usually remains on the foliage, either on the under-side of the leaves or sheltered at the leaf bases. The insects injure plants such as potato, tomato, tobacco, and lettuce by chewing holes into the leaves, and in cases of extreme infestation cause complete defoliation. On the tuberous root crops, such as carrots, turnips, and radishes, as well as the ordinary foliage injury, the insects feed on the young centre growth, and also burrow into the tops of the fleshy roots. Where infestation is heavy the tuberous roots may be riddled.

Control of the insect on crops such as potatoes may be obtained by the use of arsenate of lead, applied either as a spray or as a dust. Similarly, young tuberous crops may be so treated *in the early stages.* In the later stages of development in tuberous crops, and at any stage in the growth of plants such as lettuce, arsenate of lead cannot be used with safety because of the danger of poisonous residues accumulating on the plant. A general practice in these cases is to apply a bait, the attractant

being the cut tops of plants such as tomatoes, that have passed the productive stage, or cape weed. This plant tissue may be dipped in an arsenate of lead solution or dusted with arsenate of lead powder, and it is then distributed among the plants to be protected. Preferably, the cut tops should be partly buried at intervals beween the crop rows, the distribution taking place in the late afternoon.

Because of the good rains during recent months, weeds are extremely plentiful in a number of infested crops. Some of these weeds are themselves infested, and others provide excellent cover for the pest. Chipping may, therefore, drive both larvæ and adults on to the cultivated host and may, unless precautions are taken, accentuate the position. When weeds are prevalent, they should, therefore, be sprayed or dusted with arsenate of lead a week or so prior to chipping, if the application of this insecticide may be made without contaminating the edible crop. Many of the insects will then be destroyed and chipping can be carried out with reasonable safety.

Thorough ploughing before planting a crop and, also, subsequent to its removal, should destroy a considerable number of the pupæ in the ground and reduce the amount of carry-over from season to season.

—*J. A. Weddell.*

MITE INJURY OF TOMATOES.

With the approach of the warmer spring months, tomato-growers in Central Queensland will need to take precautions against injury caused by the tomato mite.

The mite is minute, creamy white to greyish in colour, and invisible to the naked eye. Its presence, therefore, is not detected until the first symptoms of injury appear. Normally the field crop does not show obvious symptoms until in bearing, but seedbeds and newly planted out seedlings may carry heavy populations of the pest. The mites breed rapidly, particularly if a wet period is followed by warm weather.

Mite injury to tomato plants is frequently wrongly attributed to unfavourable soil for climatic conditions. The injury, however, is quite characteristic and is first seen at the base of the plant. The lower leaves curl slightly, acquire a bronze colour, wither and die. The stem loses the surface hairs, becomes smooth and smoky in appearance, and may show superficial cracks. Because of the stem discolouration, mite injury is often known as "smoky stem." The mites gradually spread along the vines towards fresh growth, discolouring the stem and destroying the foliage until, ultimately, only small bunches of new growth remain at the tips. Heavy blossom loss is common and the setting of the fruit is seriously curtailed. In Central Queensland, stem and foliage injuries are most important, but occasionally, in very heavy infestations, fruit may be damaged. Attacked fruit loses its lustre and then develops a pronounced darkening and cracking of the skin, which produce an unsightly though usually edible fruit.

Smaller fruits, a shortened picking period, and greater susceptibility of the fruit and stem to sunburning are some obvious results of mite attacks.

The wild gooseberry, the cape gooseberry, and other allied plants commonly found in tomato areas of Central Queensland carry a mite similar in habits and appearance to that on the tomato plant. Mites on these weeds very probably spread to the tomato plant, and clean cultivation throughout the season on the headlands and within the field is therefore desirable.

Sulphur dust and sulphur compounds are very satisfactory for the control of the tomato mite.

Proprietary dusting sulphurs, flowers of sulphur, or ground sulphur can be used at the rate of 4 lb. to 14 lb. per acre, depending on the age and size of the treated plants. The addition of an equal quantity of fine hydrated lime or kaolin to the flowers of sulphur or ground sulphur gives a free running dust which is more easily applied than sulphur alone.

Lime sulphur, one in 80 to 120, gives excellent control, the weaker dilution being used in warm weather. Several proprietary brands of wettable sulphurs are also satisfactory.

A thorough spraying with lime sulphur checks mite infestation more quickly than the sulphur dusting, but the effect of the latter treatment persists for a longer period.

Tomatoes should be treated from the seedling stage onwards, the interval between applications depending on the weather. In the warmer months treatments may be necessary every fortnight, but in the winter once in six weeks may be sufficient.

In the warm coastal areas, the successful culture of tomatoes without the use of mite control measures is frequently impossible. The loss of the foliage cover is such that plants wilted by the tomato mite seldom regain their normal vigour. Consistent attention to the control of the tomato mite will result in better yields, larger and more attractive fruit, and a marked extension in the bearing period of the crop.

—*W. J. S. Sloan.*

CUCUMBER GROWING.

The warmth of the climate makes this crop a very suitable one for Queensland. In the coastal and northern districts several crops can be grown during the season.

Planting is carried out usually in the southern coastal districts from September to January, and on the tablelands from October to January; in the northern districts, on the coastal areas from July to January, and on the tableland and inland areas from August to January.

The Agricultural Chemist, in his pamphlet on "Complete Fertilizers," states: Cucumbers may be grown on almost any soil so long as it is fairly light and loamy and plenty of manure is added. The pits or hills should be prepared by mixing a large amount of well-rotted stable manure, sheep or fowl dung, ashes, and bonedust with the soil. Apply in addition to the following artificial fertilizer:—

1½ cwt. sulphate of ammona or nitrate of soda;

3 to 4 cwt. Nauru phosphate—superphosphate mixture;

1 to 1½ cwt. sulphate of potash;

or 6 to 8 cwt. of a 5-12-5 mixture fertilizer per acre, or 2 to 3 oz. of the same mixture per square yard.

The terms "pits" or "hills" are used to represent groups of four or five plants. At one time the seed was sown always on hills raised above the ground level, but unless the ground is badly drained this practice need not be followed.

Four or five plants are sufficient to a "hill," and the seeds should be placed 3 or 4 inches apart and about one inch below the surface. The "hills" should be about 4 feet apart each way, and the whole surface left loosely cultivated.

Should the plants send out their runners to a distance of 2 or 3 feet without setting cucumbers, fruiting may often be induced by pinching out the tips of the runners.

Cucumbers should be harvested when nearly full grown, before the seeds harden and the skin begins to turn yellow.

The time from planting to harvesting is usually about three months, and 1 lb. of seed set out as directed will plant an acre.

The varieties recommended are: For market purposes, Imperial White Spine; for pickling, Early Green Cluster.

—*C. N. Morgan.*

PREPARING FOR AND PLANTING CITRUS TREES.

The selection of the orchard site is of great importance. Citrus trees thrive in a frost-free, well-sheltered, warm situation. In districts where the prevailing winds are likely to interfere with the normal tree growth, belts of standing timber or scrub should be retained as a protection to the orchard. In inland areas, where timber is scarce, shelter belts should be planted.

The site should be an area of unbroken, nearly level or gently sloping land. Steep hillsides should be avoided, for, in addition to the risk of irreparable losses by soil erosion, the costs of general orchard practice are high. Most places along the coast are free from damaging frosts. In the Burnett district, however, low temperatures have occurred on occasions, causing injury to young citrus trees. In such districts, hollows and low areas, where frosts are likely to be experienced, should be avoided as sites for citrus orchards.

The first essential in planting an orchard is to plough the land thoroughly and subsoil it, always, however, taking care that the subsoil is not brought to the surface. This can be done by ploughing a furrow in the usual way, followed by a subsoiler to loosen up the bottom of the furrow before the next sod is turned. Ploughing should be followed by harrowing, working-down, and grading.

Citrus trees require plenty of room for growth and cultivation. The mistake of close planting has generally been a common one. In the drier areas, where the application of water can be controlled, plantings should be made at least 30 feet apart. This distance, of course, can be varied according to soil and climatic conditions, but it should never be less than 25 feet.

To ensure the young trees being placed exactly in the position occupied by their place pegs, a planting board will be found useful and is easily constructed. A board some 4 or 5 feet in length, 4 or 5

inches in width, and 1 inch thick, is used, and a "V" notch is cut in the middle of one side and of each end. The centre notch is placed against the peg denoting the position of the tree, and pegs are driven in at the notches at either end of the board. The board and the tree peg are then removed, leaving the latter two pegs in place.

The hole to receive the tree is next dug, the board being again brought into use, and fixed, as before, at the ordinary soil level between the two remaining pegs. The tree is placed in the hole at the centre notch in the board, taking the position formerly occupied by the tree peg, and the soil filled in.

The planting board serves another purpose in that it ensures the planting of the tree at the proper depth—the depth at which it was grown in the nursery. The mark can usually be distinguished on the tree.

The union of the stock and scion is usually a weak spot in a tree and liable to attack from fungus diseases; it should, therefore, be kept above the level of the soil. When using the planting board, the union should be kept slightly above the top of the board to ensure that the tree is not planted too deeply.

In digging the holes for the trees, the surface soil should be taken out and kept on one side. The subsoil at the bottom of the hole should be finely broken up. If the land has been properly prepared, there will be no need to dig deep holes. So long as they are large enough to space the roots without cramping they will serve the purpose. A little top soil may be returned to form a small mound at the bottom of the hole.

The roots, which should be carefully washed and trimmed, should be spaced as evenly as possible, and with a downward and outward slope of from 40 to 45 degrees. The spaces should then be filled with fine soil and pressed firmly, water being applied and allowed to soak in before the hole is completely refilled with soil. Where there is danger of sunscald the trees should be protected by cylinders of paper placed around the trunks.

—*R. L. Prest.*

ROSELLAS.

The selection of a sound, fertile seed is the most important point in rosella growing. Seeds grown in this State are generally of good quality, because of the long maturing season due to absence of frost.

Any moderately good soil will grow rosellas well, but if the crop is to be grown on a large scale, a soil with a clay subsoil close to the surface should be avoided.

The seeds are usually planted out in a seed bed in spring, and the plants, when 6 inches high, set out in rows about 6 feet apart. If the grower is not disposed to start his seeds from beds, the seed may be planted where the bushes are to remain.

Thorough cultivation is essential and weeds should be kept in check, as they affect seriously the growth of the plants.

When the fruit is mature, it is advisable to lose no time in picking it, as the fruit stalk has a tendency to toughen, thereby making gathering a slower task than it should be.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

MARKET conditions during August showed improvement on those prevailing earlier, as the fruit was keeping much better, giving buyers more confidence in paying higher prices. Good quality oranges are now selling at firm payable values, but small or skin-marked lines are very hard to sell. Mandarins of quality return as high as 15s. per case, but small lines are almost unsaleable.

Pineapples have eased in price on all markets. Complaints of green and black-heart fruit are still received from the South. Papaws are also being sent to Southern markets in too green a condition, to the detriment of the market. It is unfortunate that this warning has to be continually repeated.

Custard apples are now scarce and will soon be off the market. First consignments of mangoes will be displayed in the near future, and again the warning is sounded against sending green consignments; green, immature fruit, while, perhaps selling at its first appearance on the market, is usually the cause of following consignments failing to gain favour.

The following were the ruling market prices during the last week of August, 1938:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Small, 4s. 6d. to 5s. 6d.; sixes, 5s. to 12s; sevens, 7s. 6d. to 15s. 6d.; eights, 12s. to 16s.; nines, 14s. to 16s. 6d.

Sydney.—Sixes, 10s. to 14s.; sevens, 13s. to 16s.; eights, 16s. to 19s.; nines, 16s. to 19s.

Melbourne.—Sixes, 10s. to 12s.; sevens, 12s. to 15s.; eights, 14s to 17s.; nines, 14s. to 17s.

Lady's Finger, 1½d. to 7d. per dozen.

Pineapples.

Brisbane.—Smoothleaf, 3s. to 5s. 6d. per case, 4s. to 6s. per dozen; Ripley, 3s. to 4s. 6d. per case, 3d. to 2s. 6d. per dozen.

Sydney.—Smoothleaf, 6s. to 9s. per case. Old stocks and poor lines from 4s. and hard of sale.

Melbourne.—Smoothleaf, 7s. to 8s. per case.

Southern buyers have complained of black heart in some lines. Green fruit is still being sent in and is hard to sell.

Papaws.

Brisbane.—Yarwun, 3s. to 7s. tropical case; Gunalda, 3s. to 4s. 6d. bushel case; Locals, 1s. 6d. to 3s. bushel case.

Sydney.—2s. to 10s. The wide discrepancy in prices speaks for itself. Green lines will not sell, and reduce all values.

Melbourne.—8s. to 12s. Too many lines of green fruit have forced values to ease.

Custard Apples.

Brisbane.—2s. 6d. to 5s. per half-bushel.

against t·ason is now drawing to a close and good lines of fruit are [illegible]

Monstera Deliciosa.

4s. to 6s. per dozen.

CITRUS FRUITS.

Oranges.

Brisbane.—4s. to 5s. per case; choice grades to 7s.; small sizes 3s. per bushel.

Mandarins.

Brisbane.—Gayndah Ellendales, 9s. to 15s. per case; Glens, 6s. to 13s.; Emperors, 6s. to 9s.; Scarlets, 4s. to 9s.

Small sizes practically unsaleable.

Grapefruit.

Brisbane.—Locals, 4s. to 8s. per bushel; Southern Marsh, 7s. per bushel.

Lemons.

Brisbane.—Gayndah, 6s. to 9s.; specials higher; Locals, 3s. to 6s.

DECIDUOUS FRUITS.

Apples (Southern).

Brisbane.—Jonathan, 7s. 6d. to 12s.; Granny Smith, 8s. to 14s.: Delicious, 9s. to 11s.; Cleopatra, 7s. to 11s.; Sturmer, 5s. to 8s. 6d.; Rome Beauty, 8s. to 10s.; French Crab, 7s. to 8s.

Shrivelled and specky lines hard of sale.

Pears (Southern).

Brisbane.—Winter Cole, 10s. to 14s.; Josephine, 7s. to 13s; Beurre Bose, 6s. to 8s. 6d.; Winter Nelis, 6s. to 11s.

Strawberries.

Brisbane.—4s. to 6s. per dozen boxes; Specials to 8s. per dozen boxes.

Sydney.—Trays, 2s. to 4s. 6d; boxes, 5s. to 10s. per dozen.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 2s. to 4s.; green, 2s. to 4s.; choice coloured, 4s. to 5s. Poor quality fruit unsaleable.

Passion Fruit.

Brisbane.—8s. to 9s. half-bushel; Specials to 11s.

Cape Gooseberries.

5d. to 6d. per lb.

MISCELLANEOUS, VEGETABLES, &c.

Cucumbers.—8s. to 9s. per case.

Pumpkins.—5s. to 7s. per bag.

Marrows.—1s. 6d. to 4s. per dozen.

Lettuce.—6d. to 2s. dozen.

Cabbage.—1s. 6d. to 3s. dozen.

Cauliflowers.—Small, 1s. to 4s.; large to 11s. dozen.

Beans.—14s. to 18s. sugar bag; poorer lines lower. **Melbourne** prices 6d. to 9d. lb.

Peas.—6s. to 8s. per sugar bag; special higher.

Beetroot.—4d. to 9d. bundle.

Chokos.—6d. to 1s. 6d. dozen.

Carrots.—3d. to 1s. bundle.

CLEAN CROPS.

With the coming of the warmer weather, all kinds of weeds will be making their appearance on cultivated land and among row crops. Where practicable, inter-row cultivation and chipping are effective methods of weed control.

Crops on land that has been fallowed thoroughly show a greater freedom from weed infestation than crops in adjacent paddocks which have been prepared hurriedly and incompletely. Where sheep are kept weeds can be controlled very inexpensively, for the flock will keep the fallowed field and headlands free from infestation.

The sowing of clean seed on clean land will be well repaid in the resultant clean crop and the higher price obtained for it. Therefore, wherever possible, field work should be so planned that weeds are never allowed to grow to the seedling stage.

An Experiment in Soaking of Cane Plants.*

N. J. KING.

THE subject of plant soaking prior to planting has received considerable attention at different times and in various sugar countries of the world. Experiments have been carried out with the soaking of plants for periods from twelve to forty-eight hours in water and in solutions of lime, magnesium sulphate, and other compounds. Results have not always been conclusive, and frequently they have been almost contradictory. But when one considers the variety of conditions obtaining in sugar countries on opposite sides of the globe, some inconsistencies are to be expected. Factors which may have effect on the results of plant soaking would include (1) age of cane plants, (2) succulence of the plants, (3) moisture content of the soil, (4) state of advancement of buds, and (5) possibly the cane variety.

Plate 122.

Showing effect of soaking plants under conditions of perfect soil moisture. Rows on left of photograph planted with soaked plants, on right unsoaked plants.

For years it has been the general practice on the Bundaberg Experiment Station to soak cane plants. Soils are usually dry for spring planting, and frequently so for autumn planting. In many cases the plants also are lacking in succulence at this time of the year, and it was inferred that the soaking and absorption of water would enable the plant to germinate more quickly.

During the spring of 1937 we received at the Bundaberg Experiment Station 109 points of rain on 27th August. We were just ready to plant and were forced to delay operations until the 30th

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1938.

August, as the land was too wet for the drill plough. The plants were just eleven months old irrigated cane, full of growth, and very succulent. Under these conditions of optimum soil moisture and young soft plants one might not consider that any advantage would accrue from soaking in water. However, the plants for the first day's planting were soaked from 5 p.m. to 8 a.m., taken to the field and planted in the moist soil. For the next day's planting on the same block, the plants came from the same source but were not soaked. In this case the plants were just bagged and stacked overnight. The accompanying photograph shows the difference in germination a month after planting. The cane on the left of the photograph is from soaked plants, while that on the right is from unsoaked plants.

Whether such a remarkable difference would result under all conditions in Bundaberg is doubtful, but it would appear that at least some improvement could be expected.

The unsoaked section did germinate ultimately and gave just as good a strike as the soaked section, but the advantage is that the soaked section got away to an early start and retained its lead.

A word of warning should be issued in respect of soaking cane plants when planting susceptible varieties in localities where gumming and/or leaf-scald are present; under such conditions the soaking of plants could serve to spread the disease, and the practice is to be discouraged.

SEASONS AND COSTS.

The present sugar situation reminds us again—if a reminder *is* needed—of the great difference between farming and other industries. The manufacturer, for instance, can make an accurate estimate of the raw materials he requires to keep his business going and can calculate to a fraction the cost of production.

The farmer can certainly make his estimates, but with all the skill and will in the world there can be no certainty about them. Nature is bountiful, but sometimes capricious, as she has been during the past winter. The farmer has to make allowances for the unexpected, and this margin of safety applies all round in agricultural production and adds to the cost.

The moral of this is that, in providing a stable economic foundation for the farming industry, we must take seasonal risks as well as real costs into consideration.

FALSE ECONOMY.

The other day I ordered some cement to do some repairs around the yard. The cement was delivered in paper bags, and so one small problem was solved—I hadn't to worry about the return or the saving of the bags. A friend of mine—a farmer—has a pet economy that, you'll agree, is not peculiar to himself alone. Whenever he gets a parcel he carefully undoes every knot in the string with which it is tied, winds it up, and puts it carefully aside for future use. He laughs at his own little weakness and admits that if he gave as much time to keeping his gates in order or knocking a few nails in where they are required he would save far more than a few pence worth of string and, in comparison, earn as many pounds.

This false economy is a common disease which we all have in some form or another. How often every one of us in effecting tiddly-winking economies have neglected the worth-while jobs that mean real money to us in the long run!—"Blythe," in *The Farmer and Stockbreeder* (England).

A Green Manure Crop.*

N. J. KING.

DURING November, 1931, seeds of several green manure crops were received in small quantities from the Council for Scientific and Industrial Research, and were planted out on the Bundaberg Experiment Station. From these only one, *Crotolaria goreensis*, has survived several trials, and is considered to be of sufficient value to justify a short note on its performance. The several varieties were planted here on 2nd December, 1931, and it says much for the hardiness of *C. goreensis* that it was the only one to withstand the drought which began in January, 1932. During these severe drought conditions the rainfalls at the Station were—January, 1·62 in.; February, 0·27 in.; March, 0·10 in.; April, 1·75 in.

Seed was collected from the crop and was replanted in the spring of 1932 and again seed was collected. Since that time several sowings have been made on a small scale and seed has been supplied to the Queensland Acclimatisation Society and for distribution to the pineapple growers of coastal South Queensland for use as an inter-row crop for humus production.

C. goreensis is a small-leafed, upright, branching plant. It does not lie down or run along the ground and does not possess runners similar to the cowpeas and Mauritius beans. It appears to be a hot weather grower, not developing much growth before late November in Bundaberg and making most prolific growth from December to March. It is definitely a long fallow cover crop. Planted in spring it will not flower before April, and mature seed is not obtained from the plant prior to late April or early May. On account of its upright habit it is easy to plough in, no vines being present to impede the work of the plough. The seed is flat and kidney shaped and about one-eighth of an inch in length. The crop will seed very prolifically if allowed to do so. The small size of the seed allows of an acre being planted thickly with 10 lb. of seed. Germination is sometimes irregular, possibly due to the picking or sowing of immature seed.

The advantage of such a crop over Poona pea is that where land is being prepared for spring planting the *C. goreensis* provides a much longer cover crop without danger of seeding and consequent volunteer plants in the cultivation. Poona pea must be ploughed in in January to avoid seeding and volunteer crops. *C. goreensis* can be left to take full advantage of the wet season, produce a much larger crop thereby, and then be ploughed in during April when soil conditions are usually sufficiently dry to enable uninterrupted ploughing to be carried out.

Insofar as North Queensland is concerned Poona pea is not an ideal green crop. The ploughing-in period is the wet season, and if rains prevent this the crop may seed and produce troublesome volunteers in the subsequent cane crop. Since a long fallow crop would be a definite advantage in those areas some small plantings of *C. goreensis* are being made to test its suitability to North Queensland conditions.

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* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for July, 1938.

As regards mass of foliage the crop is quite satisfactory. The crop illustrated was 7 ft. 6 in. high in May, 1938, just at time of flowering. It was desired to collect seed from this crop, so it was allowed to stand. In June a section 10 ft. x 10 ft. was cut out and weighed, and the weight calculated at 15·8 tons per acre. By this time, however, much of the leaf had fallen owing to seeding and the stems had become woody and lighter than in the younger stage.

Plate 123.

A crop of *Crotolaria goreensis*, 7 ft. 6 in. high, growing on the Bundaberg Experiment Station.

The nitrogen content of the plant was 2·18 per cent. on the dry material. Estimating the moisture content of the plant at 75 per cent. this crop would return to the soil nitrogen equivalent to 905 lb. of sulphate of ammonia per acre.

Some of the crotolarias have been reported as being poisonous to stock. There is no evidence that this variety is in any way harmful.

The Cane Beetle Borer.*

J. H. BUZACOTT.

DURING the past year further work has been carried out with regard to the control of the cane beetle borer.

A number of trashing trials were established in different localities and observations were made on the effect of artificial trashing of cane on weight, c.c.s., rind-hardness, and borer population. In each trial there was included untrashed cane, cane trashed twice, and cane trashed three times. Trashing was carried out at 2-monthly intervals and was done carefully; this proved costly, but as the experiment was made in order to determine as accurately as possible whether any advantage could be obtained from trashing, it was deemed advisable, at least in these preliminary tests, to make trashing thorough, regardless of cost.

The first trashing was made when stools showed about a foot of cane, and in view of the fact that, at least in the cane trashed three times, there was no accumulation of trash at any time around the stalks, it is not thought that trashing, when carried out on a commercial scale, could yield results equal to these experimental plots.

An increase in weight of trashed cane over untrashed cane was registered in two out of a total of six plots, and no significant difference was recorded for the other four. The two plots in which the increase occurred were both plant cane in which borers were plentiful, and it is believed that the increase in weight was mainly due to the smaller number of borers (and so less borer damage) in the trashed cane.

In all cases there was a smaller borer population in trashed cane than in untrashed. This difference was very marked, and in one of the badly-infested plant cane plots the figures were as follows:—

Untrashed	132,000 borers per acre.
Twice trashed	27,000 borers per acre.
Thrice trashed	12,000 borers per acre.

No significant difference in c.c.s. occurred except in one plot; this was somewhat unexpected, as it was thought that the greater borer damage in untrashed cane would have been responsible for a lowering of the c.c.s. However, it is possible that there would have been a much greater difference in c.c.s. had the plots been harvested later in the season; as it happened, both plots with high borer infestation were harvested early in the year and apparently at that time much deterioration of the cane had not occurred.

Previously, it had generally been supposed that trashing caused a reduction in borer damage by virtue of the fact that exposure to light and the weather caused the cane rind to harden. When rind-hardness tests were made on cane from the various treatments it was therefore

* Paper contributed at a Conference of Cane Pests Destruction Boards, held at Meringa, 25th May, 1938.

somewhat surprising to find that the hardness was unaffected by the removal of trash. This leads one to the assumption that the trash in itself must be the important factor in the infestation of the untrashed cane. Presumably it affords cover for the beetles and possibly also assists them in the act of oviposition.

This experimental work, in general, seems to indicate that where intense borer populations exist some relief may be expected by trashing the cane. It has yet to be proved, however, that trashing the cut but a short time before harvest, as has been the usual practice, will afford much benefit.

A number of varietal trials to determine the comparative resistance of several varieties to borers were carried out during the season. These trials further indicated that Q.2 is highly resistant to borers and emphasised the susceptibility of Badila. The variety Q.10 also showed fair resistance and seems worthy of a trial in borer-affected areas provided that its other tests prove satisfactory. Still further tests with new varieties are in progress now, and the results from these will be obtained during the coming crushing season.

Considerable progress has been made in testing the rind-hardness of varieties, and it is confidently expected that the use of this reading in conjunction with observations on certain habits of the varieties will enable us to forecast the reaction of them to borers and thereby enable us to eliminate many of the trials which take so long to produce results. In the meantime it is necessary to continue with the trials in order to obtain a basis for the correlation of rind-hardness and other factors with the known reaction towards borers.

PREPARED POULTRY FOODS.

The domestic fowl appears to have no sense of smell and but little of taste. The senses of sight and touch, however, are very keenly developed, so that it becomes important to prepare poultry foods in an attractive form. The fowl relies largely on past experience in accepting food, and for that reason feeding problems must be always a subject of close study.

Excessively fine, dusty foods—e.g., some biscuit meals—should never be fed without some preliminary treatment. They tend to cause clogging in the mouth, and fine particles lodged in the respiratory tract are a source of irritation. There also is the additional danger of distended crops. Such dry foods should be incorporated carefully in a mash and, if necessary, moistened.

A food which is flaky but not brittle is well taken by fowls—hence the popularity of bran in mashes. Hard grains should be crushed or ground coarsely.

Soaking is an alternative method of helping the gizzard to cope with hard foods.

Predigested, fermented, or malted foods are actually lower in nutritive value than the material from which they are derived, and, in normal circumstances should not be purchased.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and Jersey Cattle Society, production charts for which were compiled during the month of July, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD 350 LB.).			
Alfa Vale Gem 4th (365 days)	W. H. Thompson, Manumbar road, Nanango	21,325·25	884·217	Reward of Fairfield
Daisy 22nd of Sunnyside	P. Moore, Wooroolin	10,895·65	405·765	Patrol of Cosey Camp
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Trevor Hill Larkspur 2nd	G. Gwynne, Umbiram	8,466·47	386·403	North Glen Emblem
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Alfa Vale Nellie 6th	W. Hinrichsen, Ardilea, Clifton	8,039·5	324·164	Reward of Fairfield
	JUNIOR, 2 YEARS.			
Rosenthal Roseleaf 17th	M. C. and A. M. Sullivan, Pittsworth	11,217·98	469·624	Rosenthal Carbine
Trevor Hill Satin (255 days)	G. Gwynne, Umbiram	6,627·96	281·411	North Glen Emblem
Navillus Charm 3rd	Con. O'Sullivan, Navillus, Ascot	6,548·8	237·656	Alfa Vale Re Nell
	JERSEY.			
	MATURE COW (STANDARD 350 LB.).			
Condong Seashore	J. Sigley, Millaa Millaa	8,040·8	445·372	Northern Star of Binna Burra
Beryl of Kensington	Miss J. Nolan, Lindum	7,450·9	356·193	Banyule Lord Tiddlewink
	JUNIOR, 4 YEARS (STANDARD 310 LB.).			
Brooklodge Marina (245 days)	L. Nicholls, North Tambourine	5,962·85	330·071	Pineview Modeller
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Woodbine Royal Lady (260 days)	T. Elliott, Sandy Creek, Gympie	5,490·85	295·019	Brooklands Royal Gift
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Oxford Princess Daffodil	E. Burton and Sons, Wanora	6,148·29	361·415	Oxford Peer
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Wyreene Lotus Lily 3rd (365 days)	G. Schroder, Warra	8,613·57	453·241	Lyndhurst Majesty
Pineview Spotted Queen	J. Hunter and Sons, Borallon	4,754·01	290·767	Oxford Peer
Pineview Jean	J. Hunter and Sons, Borallon	5,002·69	288·414	Oxford Jeweller

The Tropics and Man

Man versus Machine.

DOUGLAS H. K. LEE, Professor of Physiology, University of Queensland.

FRANKENSTEIN was popular as a character of fiction but immensely more popular as a film fantasy. The pleasure of terror—in small doses—finds widespread acceptance, and "thrills" will fill any auditorium. Grotesque machine-age caricatures of the beautiful Grecian Galatea have fixed in the minds of most people a vague fear that some day the invention will evade control and take charge of human affairs, forcing its creator into timorous submission if not actually into annihilation. Almost without exception the triumphant machine is endowed with bodily form—and human viciousness. The battle is depicted in the same terms as primitive man regarded his war with the elements of nature—a titanic struggle between living, thinking creatures.

As I shall show before concluding this talk, the battle is already joined. While we sit and wait for our anthropomorphic enemy to appear, the issue is being decided in a totally different fashion. The game is not being played according to the rules; large numbers of people are unaware that anything untoward is taking place. But, before we consider the situation, let us examine the chief participants side by side, for, in whatever guise he may appear, an enemy known is an enemy half-defeated.

The Characteristics of a Machine.

If I say "machine" to you, what immediately springs to your mind? I venture to think it is somewhat as follows—a fairly large, robust, moving mass of wheels, cranks, and noise, designed to do a particular job, and to do it continuously as long as it gets raw material and the engine-driver says it shall keep going. (This is, of course, not completely true of every machine, but it will do as an example.) First and foremost, it has a definite job to do. We have printing machines, bottling machines, lottery machines—did somebody say "political machines?" I cannot accept responsibility for them. Even Heath Robinson, in his most inspired moments does not expect a bottling machine to print a treasury note. Man seems to expect and to be expected to do almost any job that comes his way (even to giving and listening to talks).

Next comes the question of size. In order to carry out a relatively simple job a machine must usually have a huge mass. To print and fold a paper is not in itself a terrific operation, but look at the vastness of printing machinery as seen on the films. The secret is, of course, the enormous power or rapidity with which a machine works. Puny indeed is a swimmer beside the Queen Mary; feeble the output of Caxton against the rushing torrents from the giants of Fleet Street.

Simplicity is a further characteristic of the machine. What, you might object, do you call that complicated mass of wheels, belts, levers, tubes and dials, "simple"? Indeed, I do. Compared to the simplest living creature, the most complicated machine is as a child's blocks to a motor factory.

A last important point is that a machine must be directed. Starting, stopping, and adjusting must be carried out directly or indirectly by some agency, usually human, outside itself. It is true that science has made them more and more automatic, like the light-buoy which switches itself on at dusk or when a fog settles, the boiler fire which stokes itself, and the aeroplane which guides itself to its destination, but these are all simple short-cuts in planning, not to be compared in any way with the adaptability and judgment of any living creature, let alone man.

These then are the general characteristics of a machine—singleness of purpose, size, stability, relative simplicity, continued operation, power, need of control. What of Man?

Man—the Unknown.

Bearing in mind the title of Alexis Carol's book—"Man, the Unknown"—dare I venture any opinion on this subject? Upon what do we pride ourselves, in what way do we arise above the merely inanimate?

First and foremost I would put adaptability. What is there that man cannot attempt, where lie the unconquered places of our sphere? Our submarines can go to a depth of over 300 feet in the ocean, our airplanes fly with comparative ease up to 30,000 feet, our intrepid balloonists have penetrated to the stratosphere. What other animal is there which can live in the tropics, and a few weeks later at the pole? Is there a machine which can reflect with foreboding upon European events, luxuriate in a warm bath, digest a more or less appetisingly fried egg, give a supposedly authoritative discourse upon some obscure subject, play tennis, attend an organised relaxation and memorise a mass of unimportant detail all in the space of sixteen hours with only minor external adjustments to the momentary situation? Yet this is only a fraction of what the average man accomplishes in that period, day after day, for years. There are not many machines which can produce a record like that of the human heart, carrying out most complex chemical changes and pumping blood under pressure from upwards of sixty times a minute without a pause for fifty, sixty, seventy or more years—2,207,520,000 times—with no mechanical renewals and no specific attention (let us hope). Remember too, that this heart has had to adjust its work to rapidly changing conditions—that 100 yards you ran in 10½ seconds, that enormous dinner you ate last Christmas, that speech you had to make at the Intelligentia Club, that time you saw your name after the winning number in the lottery—no kindly engineer to come along and adjust the valves or attend to oiling, no new piston rings or even timing adjustments.

Consider into what a confined space is packed all the apparatus necessary for the remarkable, nay miraculous, diversity of purpose.

Nature has developed her machinery along entirely different lines. Man has taken certain somewhat superficial aspects of Nature's machinery and evolved from them his existing mechanical craft, adding just an odd new invention here and there, such as the free wheel, as he went. In man's plan, singleness of purpose was the keynote; in man's own structure multplicity of purpose provides an infinite variety of orchestration. A hopper to a machine remains a hopper; the corresponding organ in the body—the stomach—has a variety of other functions. Not only does it hold food, but it starts treating it, the rapidity with which it treats

it being automatically adjusted to the type and amount of food. Furthermore, it cleans the food of harmful germs, pours out a substance necessary for blood formation and another one necessary for the nervous system. What a treasure such a hopper would be to the industrialist—a veritable factory in itself.

For these remarkable properties, a price has to be paid. That price is susceptibility. The body, for all its adaptability, is by no means robust. The buffets it can take are very limited, the opportunities for its becoming temporarily, or permanently, incapacitated are many. Fatigue is a common experience. Many different activities can be carried out in succession, but the same one cannot be continued for more than a limited period. The human body owes its triumphs, therefore, to its adaptability, self-direction and compactness, but suffers the weaknesses of complexity, instability and fatigue.

Which, then, is the superior—man or machine? Like most quandaries, this has no answer—there is no question? Man and machine are each designed for the work they have to do; machine for power, simplicity, stability; man for adaptability, self-direction and compactness. On this plane there is not, nor can there be any real competition. The danger lies in a very different realm, the realm of civil organisation.

Civil War.

If production is increased in quantity and variety, as it certainly is by the extensive development of machinery, one or both of two things must in the long-run happen—(1) an increased use of products by mankind, or, in the words which are so familiar, "an increased standard of living;" (2) a decrease in the personal labour expended in production. The latter should logically result in increased leisure. Both of these consequences have come about, but by no means in the simple logical fashion than an idealist might expect. Unfortunately, the human machine has shown up its weaknesses only too clearly. What would have been clear enough in a purely intellectual exercise, has been obscured by the smoke and dust of bitter conflict—conflict within the human ranks. When all should have been united in developing all the benefits of machine labour, violent schisms rent the ranks and self-interest was allowed to supplant human welfare. While humans rose and fell, fought and even died for their limited ideals and interests, the evil consequences of mass production were allowed, and even at times encouraged to develop side by side with the benefits. Unemployment, industrial unrest, depression, bankruptcy, distressed areas were the inevitable crop. In war there are no victors, all must be losers. While men bickered and fought, the machine quickly developed and seized the very ground over which men were fighting. Useless to complain now; the machine is here and the machine will stay. All we can do is to sink our differences and combine to develop the good, remove or nullify the bad, and control this Frankenstein of our own creation. The quantity and variety of goods produced are not entirely available to mankind, or how could we have a glut in a commodity while people have to go without. The logical increase of leisure is often linked with a decrease in purchasing power.

Mutual recriminations will do nothing to remedy the situation. Mankind in general is at fault in failing to keep control over the mechanical progress, in ignoring the logical consequences of limitless production, in not preparing channels for the distribution of its benefits before

they opened the hopper-doors. It might not be so bad if the faults of distribution were confined to luxuries, but they affect also the very necessities of life, our foundation foods.

It is a fallacy to compare the structure and working of a machine, with that of the human body. The fundamental principles upon which they are based are so widely different. It is a waste of time to gaze forward to the day when a machine will be invented to be the equivalent of man. The existence of civilisation depends upon winning the battle to-day against the economic and social consequences of an uncontrolled or exploited machine age.

[*Photo.: Foresty Service.*

Plate 124.

A PAUSE ON TOP OF THE PINCH.—Bullock teams are still regularly engaged in log-hauling in the rain-forests on rough range country in Queensland.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

Burr Trefoil. Some Summer-growing Fodder Plants.

F.J.M. (Bundaberg)—

The specimen is the burr trefoil, or burr clover (*Medicago denticulata*), one of the best winter trefoils in Queensland. Seed is obtainable through the ordinary commercial channels, and should preferably be sown during May. Once established in a locality, it generally spreads naturally fairly well.

There are very few summer-growing Clovers and Trefoils. You may try the Japanese Clover (*Lespedeza striata*). This is now very common in some districts, and we think, on the whole, it improves the pasture. Some pastoralists look rather askance on it, as it tends to push out the grass, and in summer time there is generally a good flush of feed. One of the very best of the summer-growing legumes is the Townsville "lucerne" (*Stylosanthes sundaica*). Seed is obtainable from Messrs. Michelmore & Co., Mackay. This legume comes in with the early summer rains. It does not seem to be very attractive to stock in its green state, but apparently becomes so when it is dying off. It is thus of value in late summer when often there is a dearth of green grass.

Queensland coastal pastures contain several natural summer-growing legumes of considerable value. One of the commonest is the tick trefoil (*Desmodium triflorum*). Seed of this legume is not stocked as far as we know, but usually it enters naturally into a pasture. It has one disadvantage—in closely grazed pasture, it grows rather too close to the ground to give stock much of a bite.

As to Kudzu (*Pueraria Thumbergia*), this plant has been boomed at different times as a fodder, but it has never taken on to any great extent in Queensland. Its principal value lies probably in its forming a dense mat and preventing erosion on gully-sides and river banks, and other places liable to soil washing. We have had very little experience with this plant, but what we do know of it suggests that stock do not take readily to it. It may be like some other plants—once they get a taste for it they will eat it readily, but they have to acquire the taste first. It is a very rampant grower in cultivated land. One of our correspondents had it growing, and became so scared of its over-running his garden and cultivation, that he cut it all out. He is a dairy farmer, and threw the vines over the fence to the cows, but although they tossed it about they would not eat a bit of it.

Specimens from Dalby.

R.A.H. (Dalby)—

1. Blue grass, *Dichanthium sericeum*. Seed of blue grass is not usually stocked by the seed merchants. You might try Messrs. Yates and Co., of Sussex street, Sydney. They sometimes list it.
2. Burr Trefoil, *Medicago denticulata*. This is probably the best trefoil of the Downs and inland Queensland generally. The burrs cause some trouble in the belly-wool of sheep, but, apart from this, it is an excellent fodder when once established. It generally comes up regularly each year, dying off at the approach of the hot weather.
3. Gall Weed, or Twin Leaf, *Zygophyllum apiculatum*, a very common weed in the brigalow country. We have never seen stock eat it, although it has been suspected of poisoning on several occasions. Force-feeding tests with it in both New South Wales and Queensland, however, have given negative results.

We have seen very good Mitchell grass in the brigalow and belah country, and the best results have been obtained by sowing the seed in October.

A Saltbush Species.

"Inquirer (Cunnamulla)—

The specimen of weed found growing on a bare claypan is *Dysphania myriocephala*, a small plant of the Saltbush family, with a fairly wide distribution in Queensland. It has been suspected of causing losses in sheep at odd times. Like sorghums, and some other plants, it contains a prussic-acid-yielding glucoside. In this condition, if eaten by hungry sheep, trouble is likely to ensue. Ordinary paddock stock, both sheep and cattle, seem frequently to feed on these prussic-acid plants with impunity. Tired and hungry animals, however—such as travelling stock—often succumb.

The grass from the Warrego River frontage, which you thought was a variety of spinifex, cannot be determined in the absence of seed-heads. Perhaps later on in the season you could send a larger specimen.

"Oriental Mustard." Knot Grass. A Common Weed.

I.R. (Jandowae)—

1. Oriental Mustard or Tumbling Mustard, *Sisymbrium orientale*, a native of Southern Europe and the near East. It is now a common naturalised weed in most temperate countries, and is a common farm weed in Queensland. It belongs to the cabbage and turnip family (the *Cruciferæ*), and like other members of this family, taints milk badly if cows are allowed to feed on it to any extent.
2. Knot grass, *Polygonum aviculare*. This is not a true grass, but belongs to the family *Polygonaceæ*. This family contains the docks and rhubarb. The present species is sometimes said to cause impaction in stock. This is because of its long running, rather fibrous stems.
3. Specimen is imperfect, but looks like *Verbena officinalis*, the common vervain, an upright plant about 3 to 4 feet high, and bearing numerous small blue flowers. It is a very common weed on the Darling Downs. Your specimen of this was very imperfect, and determination is therefore doubtful.

Pepper Cress.

H.T. (Mulgeldie)—

The specimen forwarded with your letter of the 1st instant is pepper cress, *Lepidium ruderale*, a very common weed in Queensland, and one that is very widely spread over the temperate regions of the world. It belongs to the cabbage and turnip family (the *Cruciferæ*), and is perhaps best known here as turnip weed, a name, however, given to many plants of this family in Queensland. It is a good fodder, but one of our worst offenders in the field of milk-tainting weeds. We have never heard of it causing any trouble with working horses, either in Australia or elsewhere.

Rubber Vine.

J. C. McL. (Mackay)—

The specimen bore flowers or seed-pods, but we think there is no doubt that it represents the plant commonly know in North Queensland as rubber vine, *Cryptostegia grandiflora*. It is a native it is thought of Madagascar. It is now very widely spread in most tropical countries. At one time, it was looked upon as a possible source of commercial rubber—the rubber being known under the trade name of "Palay." As to its poisonous properties, we have no definite information, but it belongs to a dangerous family, and we should say that is is probably poisonous. Stock rarely eat it to any extent, however. It has run wild in parts of the Gulf Country, making it very difficult to muster stock running on country where it abounds.

A Caustic Plant.

A. McD. (Cunnamulla)—

The specimen is *Euphorbia eremophila*, a caustic plant. This plant has a very wide distribution in Australia, from the coast to the far interior, and is generally regarded as poisonous to stock, particularly sheep. Most trouble seems to be with travelling sheep. The symptoms are described as similar to those of the effects of the ordinary caustic creeper (*Euphorbia Drummondii*). The head and neck of affected animals are said to swell considerably. If this swelling is pierced, an amber-coloured fluid exudes, and the life of the sheep may be saved. The animal's face has the appearance of having been badly scorched.

General Notes

Staff Changes and Appointments.

Mr. G. W. J. Agnew, inspector under the Diseases in Plants Acts and agent, Banana Industry Protection Acts, will be transferred from South Johnstone to Nambour, and Mr. W. G. Hancock, agent under the Banana Industry Protection Acts, who has been given the additional appointment of inspector under the Diseases in Plants Acts, will be transferred from Brisbane to South Johnstone.

Constable T. C. D. Monaghan, Tiaro, has been appointed also an inspector under the Brands Acts.

Mr. C. W. Thiele, Bundaberg (as representative of growers of sugar-cane) has been appointed to fill the vacancy on the Sugar Experiment Stations Advisory Board.

Mrs. Nancy Yaun, of Numinbah Valley, Upper Nerang, has been appointed an honorary protector under the Fauna Protection Act.

State Wheat Board.

Amendments to the State Wheat Board hail insurance scheme regulations have been made on the recommendation of the Board, and will be published in the *Government Gazette.*

The principal object of the amendments is to provide that assessors, when assessing losses, shall estimate the grade of the crop so damaged or destroyed, in accordance with the Board's classification scheme, and that the loss shall be assessed on the basis of the estimated value which the wheat would have had on the stalk at the time of harvesting if no loss through hail had been sustained, taking into account the estimated grade and any material deterioration caused by frost, rust, drought, or any other adverse cause prior to the damage or destruction by hail.

Another amendment provides that in the case of a disputed assessment, an umpire may be appointed by the claimant and the assessor, and in the event of their failing to agree on such appointment, that the umpire may be appointed by the Board.

Under a further amendment, a claimant desiring to appeal to an umpire must lodge an objection in writing and deposit two guineas with the assessor. Should the claim not be upheld, it is provided that the deposit shall be forfeited. In previous seasons, umpires were appointed by the Board and if the claim were not sustained, the grower was required to pay two guineas to the Board.

The other amendments which have been made are of a minor nature and form no material departure from the existing hail insurance compensation scheme.

Bacon for Export.

The export baconer pig class of the 1938 Royal National Exhibition was judged on carcase standards at the Brisbane Abattoir—where the live pigs were exhibited—at the conclusion of the show. A full report is being prepared for publication, with illustrations of all the carcases, in the next issue of *The Queensland Agricultural Journal.*

Lakeside Lagoons a Fauna Sanctuary.

An Order in Council has been issued under the Fauna Protection Act declaring Lakeside Lagoons, being Camping and Water Reserve R. 378, parish of Mungore, to be a sanctuary for wild life. Mr. L. A. Bates, of Lakeside, has been appointed an honorary protector.

Wild Life Preservation.

Messrs. H. J. McCulloch (Main Beach, Southport) and J. V. Sullivan (Dalrymple Heights, via Mackay) have been appointed honorary protectors under the Fauna Protection Act and honorary rangers under the Native Plants Protection Act.

Messrs. L. C. Souten and W. S. Green (Upper Nerang) have been appointed honorary protectors under the Fauna Protection Act.

Milk and Cream Test Bottles and Milk Pipettes.

New regulations have been issued under the Dairy Produce Acts setting out the specifications of the Babcock test bottles for testing milk and cream and the milk pipette for the testing of milk by the Babcock method.

Rural Topics

Keep only Good Layers.

Experiments have shown that a hen laying 160 eggs a year is worth approximately three times as much as a hen laying only 100 eggs a year. As poor layers cost almost as much a year, it is clear that net returns multiply fast from heavy layers.

It pays to weed out the poor layers from your flocks right along, keeping only the good layers especially for breeding purposes.

Here are four main characteristics to observe:—

Earliness of maturity.

Rate of egg production recorded by trap-nesting or indicated by bleaching of beak and shanks in yellow-skinned fowls.

Absence of broodiness.

Persistence of production.

A New Process for Making Butter.

The Cobden butter factory in Victoria is using a new process for making butter. The process is now in its second year, and is regarded as revolutionary. The cream is pasteurised over a Flash pasteuriser, and goes direct through the separator to a salting vat, and then to a machine which turns the liquid into butter in an instant. It is all done in a matter of seconds, it is said. Sweet cream has to be used. A saving of £6 a ton is claimed. Test shipments overseas have been favourably commented upon. The new method, however, means collecting the cream twice a day, which bars its adoption by most country factories.

Is the Australian Dairy Farmer Better Off ?

That the Australian dairy farmer is in a definitely better position than the New Zealand dairy farmer, in respect of the figure he receives for butterfat, is the opinion of the associate editor of the New Zealand "Dairy Exporter," who was at the Empire conference in Sydney. He attributes this to the operations of the Equalisation Committee and says: "The Australian housewife pays two-pence per lb. more for her butter than her New Zealand counterpart, and does it cheerfully as an assistance to the well-being of an essential industry."

Waste in Pastures.

Professor Stapledon of Wales, estimates that in England and Wales there are 16,000,000 acres of rough grazing and permanent grass waiting to be improved and brought up to a higher standard of production. He says that buttercup pastures on the good lands and poor grass on the poor lands represent the greatest waste of nutritive materials which the present British system of farming tolerates.

The Economic Cow.

The economic cow is not always the high yielding cow. She may be. High yields are apt to be deceptive. Under certain conditions it certainly pays to have extremely high-yielding cows; under other conditions it does not. Cows have to live in different climates, and have to put up with all sorts of management. In America it has been shown that, other things being equal, the bigger the cow the more milk will she give. It also has been shown that it does not always hold that because a cow is giving a big yield of milk she is producing that milk more economically than perhaps a smaller cow giving a lesser yield. There is an immense difference in the food consumption of different cows per gallon of milk produced, and there is every reason to believe that this is inherited.

The economic cow has other qualities besides that of the ability to make the greatest use of the food she eats. The economic cow must be a hardy cow. She must also be a prolific cow. There are cows which have calved every year for more than ten years. Such cows possess an important characteristic of the economic cow.—*The Australian Dairy Review.*

Beauty in the Milk Bucket.

Bathers at Willow Lake, near Glendale, California, have adopted mass-production methods to speed up the process of acquiring coveted coats of sun tan. They use a motor driven atomizer to apply a newly-developed milk spray, which is said to protect the skin from unaccustomed exposure to the sun's rays, and to help prevent burning and peeling.

Another new use for milk is developing from an unexpected quarter. A large cosmetic-manufacturing company in the United States recently placed on the market a powdered milk preparation, made principally from cows' milk, for my lady's beauty bath. A handful of the powder, it is said, will convert a tubful of water into a white, foaming mixture resembling the froth-topped contents of the bucket in the morning milking. It is claimed that it is most refreshing and beneficial to the skin. If all the ladies of the land take to using it for their daily dip, it should prove a big thing for dairy farmers.

Jersey Cows Larger in Australia.

According to Dr. John Hammond, the noted authority on animal husbandry of Cambridge University, Jersey cows in Australia are of a larger type than those in the United Kingdom. Many breeders, he said, believe that the British Jersey is too small and fine. He also said that in England cows are milked three times a day. It is claimed that the yield is 12 per cent. more than when they are milked twice a day.

Cows in Luxury.

It is reported from America that an Ayrshire breeder in New York State has provided rubber beds for his cows. The beds are made of spongy rubber a quarter of an inch thick; they cost about £4 to £5 a cow, but save 75 per cent. of the cost of straw bedding—in other words, a saving of about 28s. a day in a cow shed accommodating 100 cows. There is no likelihood, however, of rubber beds for cows becoming common on Queensland dairy farms, thanks to our fine climate.

Skim Milk as Paint.

Skim milk makes a cheap and lasting paint if used in this way:—Stir into 1 gallon of skim milk about 3 lb. of ordinary cement, and then add any colouring desired. It is necessary to stir the mixture frequently. Six hours after using, this paint will be as immovable and unaffected by water as ordinary paint that has been on for a month.

Banana Grade Standard.

An amendment to the Regulations under the Fruit and Vegetables Acts provides that all Cavendish bananas marketed in the bunch shall comply with the following grade standard: Not less than 80 per cent. of the total fruits comprising any bunch shall measure at least 5 inches in length (measured on the outside of the curve from the junction of the fruit at the stem end to the apex of the fruit), and at least 4 inches in circumference.

The "Eternal Squeal."

It was the "eternal squeal" about the disadvantages of farm life from the whole community, including the farmers themselves, that was causing the dearth of young men to go on the land, said Mr. J. Cocker at the South Taranaki Conference of the New Zealand Farmers' Union. "Farming is a good life—I would not change vocations with anyone—and I have followed it all my life," added Mr. Cocker.

Quality of Sudan Grass Seed.

Buyers of Sudan grass seed should make certain that their purchases comply with the prescribed germination standard of 70 per cent.

An examination of seed offered for sale has revealed many undersized and mouldy samples of poor germination, containing an abnormal quanity of unformed or sterile seeds.

Any farmer in doubt as to the quality of seed may forward a 4 oz. sample to the seed testing station, Department of Agriculture and Stock, Brisbane, for a free test. In doing so, care should be taken to mark the sender's name and address clearly in block letters on the sample, which should be accompanied by a letter of advice of the despatch.

Beyond the Western Border—The "Desert" of the Text Books.

In an introductory note to an article contributed by Mr. Randolph Bedford, M.L.A., to *The Courier-Mail* (Brisbane) we are reminded that Central Australia is "no longer Australia's forgotten territory. Across it fast planes carry passengers and mails; Federal investigators have pointed to its possibilities. . . ."

In the subjoined excerpts, Mr. Bedford presents a vivid picture of the country beyond Queensland's western border fence:—

"Dajarra, the railhead, is 900 feet above sea level. The western extension is already formed—banks and cuttings and some bridges—for 20 miles west of Dajarra. At that point the hilly country ends, and for over 200 miles westward and for 500 northward the plains are open to the Barkly Tablelands flat as pancakes, except for occasional gently rolling country. On it, as in the old Coolgardie days, the railroad builders could lay a mile of track a day. And a mile of new railroad is of more value to the Central Territory than all the street and garden beautification of Alice Springs—desirable as that is.

"From the end of rail formation there are limitless plains far into the Territory —Mitchell grass, infrequent creeks, whitewoods trimmed to the formality of a Dutch garden, by sheep feeding from the trees to the height of a sheep standing on its hindlegs. In this perfect climate of hot days and cold nights there is but one perennial pest, the fly, although less offensive than the fly of a city slum area.

"And for a temporary pest of continued dry weather there are the grasshoppers; large grey yellow fellows that in their blind rush, and with the added momentum of the speeding car, can give a man a black eye, and leave him without the usual excuse of wood-chopping, because there is little wood to chop. But the grasshopper did not offer us the final insult, which is to fly into the billy and be well stewed in tea made of the last quart of water.

"With water anything will grow on these great plains to the border and for 130 miles west of it into the Territory until the mineral country replaces it.

"Mitchell and Flinders grasses, a self-cured hay on their own stalks; thousands of galahs dressed in pink and slate colour, thousands of rosy breasts turned to the sun as the birds wheel as one; the fresh winds of the downs blowing cleanliness into the land, the pastures breathing the scents of hay all day; and the cold nights that produce the fine wools of Australia.

"Over the deep channels and flood plain of the wide Georgina to Gidyea belts in the Mitchell grass the way led, and then through a gate in the unnecessary fence that marks the border. . ."

"These Eastern Central lands are not of heavy carrying capacity, but they are good, clean, light pastoral areas; Mitchell, gidyea, mulga, and good summer grasses, including the fluffy top that seeds as many times as there are rains in the year. Tobermory's homestead is a big two-storied house, and the lessee has drilled wells and installed windmills to make the country safe at Bluebush, Pituri, and No. 6; supplementing Ileriqua and Alikea waterholes and the big lagoon at Coockroach, 64 miles west of the border—and this with little or none of Government recognition.

"It is understandable that the Territory pastoralists nearest to a telegraph line or resident in the southern States are more easily heard at Canberra than the smalller men on the border fences adjoining Queensland but not of it, their voices inaudible in Darwin or Canberra. But that condition calls for a better, if not a larger staff.

"In these brilliant sun-saturated days of the alleged winter travelling is a joy. The long wide plain, gently rolling country from horizon to horizon; roly poly, or as the Americans call it, "tumbleweed," rotates before the gentle wind, sowing seed as it travels.

"A mob of horses full of curiosity mixed with a little fear, gallop towards the car, wheeling within 200 yards of us and galloping away again but to return. Galahs by the thousand wheeling all at once—kangaroo and brolga, life, warmth, sunlight, hot days, and cold nights—these are the ideal conditions for the production of fine wool, and this is the "desert" of the text books."

Cooling of Cream.

If properly used under conditions of scrupulous cleanliness, a cream cooler will give excellent results. Besides lowering the temperature of the cream and thus checking bacterial development, a cooler aerates the cream, releases gases and food flavours, and improves its consistency. Freshly separated cream, after it has been cooled sufficiently, should be mixed with the cream already held in the dairy. Fresh and over-ripe cream should not be mixed, as is often done when lots are held in separate vessels until delivery day. Cream should be stirred frequently while it is held on the farm. Proper stirring controls the ripening.

The Loquat a Pest in the Warwick District.

A proclamation has been issued under the Diseases in Plants Acts declaring loquat fruit to be a pest in the fruit district of Warwick during the period from 1st September to 31st December in each year. Orchardists in the Warwick district must, therefore, remove all loquats from their trees on or before 1st September every year.

Pure Milk Demanded.

Here is an interesting item from America: By its terms the United States Filled Milk Act prohibits the interstate distribution of any combination of milk, cream, or skimmed milk with any fat or oil, other than milk fat, so as to resemble or imitate milk or skimmed milk in any form. The United States Congress determined and declared: "That filled milk, as herein defined, is an adulterated article of food injurious to public health, and its sale constitutes a fraud on the public."

A Tale from the Other Side.

Rolling stones gather no moss, but mossy stones roll in the cash for an enterprising farmer on the other side of the Pacific. From a barren hill on his farm, in California, he sells rocks to city and suburban people who want them for making gardens and rock pools. He soon found that gardeners preferred stones with moss growing on their shady sides. Now he has raised the price of green rocks and is "turning them into greenbacks"—another name for dollars. It is better to stone the gardens than "stone the crows," apparently.

A Great Shorthorn Herd.

Farmers who as A.I.F. Diggers visited many of the famous stud stock establishments in Scotland will be interested in the news of the recent sale of the great Collynie herd of beef Shorthorns which brought renown to the little village of Tarves, not far from Aberdeen, and where it flourished for nearly a century. The famous herd will not be dispersed, however, and has been transferred to Surrey, in the South of England. One of the finest herds of Shorthorns ever bred, the Collynie cattle have contributed some splendid animals to Queensland stock and to herds in other States. Probably no herd of pedigree stock has achieved a greater world-wide reputation. Some years ago a single sire from the Collynie herd sold for £5,565.

Butter Substitutes.

Talking about butter substitutes, Mr. Lowsby, general manager of a big co-operative butter company in Victoria, told a conference of butter factory workers that this trouble has become a serious menace to the butter industry. Apparently, he said, it paid manufacturers to evade the law, for despite successful prosecutions, the business continued. However, the co-operation of Melbourne suburban municipal councils has been obtained whereby health officers will exercise more vigilance in combating this menace, and a further arrangement has been made with retail grocers and dairy produce retailers to attach to their windows a statement that "we do not sell any substitute for butter," which, no doubt, will be very helpful to the dairy industry.

A Man Named Mort.

It is good to recall on occasion something of the work of our industrial pioneers. It was a man named Mort—one of Australia's historical characters—who had the vision to investigate the possibilities of sending frozen meat to the British markets. He made one mistake, however, and that was based on his idea that Australia would never be able to grow wheat in competition with other countries. He obviously had not thought of what our Farrers, our Suttons, and our Soutters could do in the way of evolving wheats suitable for Australian conditions. To-day, wheat and meat are already among the major exports which return immense sums to Australian producers every year.

Although Mort's judgment was out in wheat, he made no mistake about meat. He was one of the first to advocate the development of secondary industries in Australia, and spent £100,000 of his own money in the research which led to the establishment of the refrigeration industry. Up to last year—and since the first frozen meat cargo was sent to England—more than 2,300,000 tons of beef, nearly 2,000,000 tons of mutton and lamb, and more than 1,700,000 tons of butter had been sent overseas. Those figures give us some slight idea of the value of Mort's pioneering work in the transport of meat.

Orchard Notes

OCTOBER.

THE COASTAL DISTRICTS.

OCTOBER is frequently a dry month over the greater part of Queensland, consequently the advice that has been given in the notes for August and September regarding the necessity of thorough cultivation to retain moisture may be again emphasised. Thorough cultivation of all orchards, vineyards, and plantations therefore is imperative if the weather is dry, as the surface soil must be kept in a state of soil mulch, and no weeds of any kind must be allowed to grow, as they act only as pumps to draw out the moisture from the soil that is required by the trees or fruit-yielding plants.

All newly planted trees should be watched carefully and if they show the slightest sign of scale insects or other pests they should receive attention at once.

Bananas.

In the warmer districts banana planting may be continued. All winter trash should be removed and the stools cleaned up. If not already done, before the winter, young plantations planted the previous season should be desuckered without delay. Those desuckered last autumn should be gone over again, and old plantations also should receive attention. Grow to each stool the number of stems which experience proves to be permissible, but only allow each stem to grow a single follower. Borers will be active again soon, and trapping should be intensified towards the end of the month and supplies of Paris green and flour (one part to six by weight) made up in readiness. Caterpillar and grasshopper plagues often occur from the end of the month onwards, and it is wise to lay in a supply of arsenic pentoxide for use in the preparation of bran baits. Watch the plantation carefully for bunchy top, and kerosene and destroy any affected plants without delay. The season of vigorous growth is now commencing, and it will pay well in more and better fruit and in stronger suckers for the next crop to apply a dressing of a complete fertilizer to each stool. Cultivate well to retain moisture, aerate the soil, and kill weeds before they seed. This will also prepare the soil for the planting next month of a green cover crop such as *Crotalaria goreensis*, thus shading the soil, preventing erosion on slopes, and enriching the soil with nitrogen and humus.

Clean out all banana refuse from the packing shed, and resolve not to allow it to accumulate in future. This will reduce the risk of the development of many fungus rots in the packed fruit.

Pineapples.

From now onwards pineapples may be planted in most districts. Plough thoroughly, remembering always that in the life of a plantation will be several years during which it will be neither possible nor desirable to do more than disturb the surface layer. Obtain advice from the Department of Agriculture and Stock as to whether the soil is sufficiently acid, and, if not, how much sulphur to apply. Care must be taken in the layout of the rows to save time and labour in cultivation and harvesting, and minimise erosion. Select planting material with discrimination from healthy and vigorous plants of a good bearing type. Beware of planting "collars of slips." Always strip off the base leaves and dry in the sun for a few days, and plant shallow. As soon as the roots form, apply 3 cwt. of 10-6-10 fertilizer to the acre. All established plantations are due for their spring fertilizer at the rate of not less than 5 cwt. per acre. Keep down weeds with the Dutch hoe; but do not disturb the soil deeply, always remembering that the pineapple is shallow-rooted and receives a sharp setback if the roots are interfered with by the use of horse-drawn implements. Clean out all pineapple refuse from the packing shed and surroundings, and thus eliminate much fungus trouble in the summer pack.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

MUCH of the matter contained under the heading of "The Coastal Districts" applies equally to the Granite Belt and the Southern and Central Tablelands, for on the spring treatment that the orchard and vineyard receives the succeeding crop of fruit very largely depends. The surface of all orchards and vineyards must be kept loose, and no weed growth of any kind should be allowed. In the western districts, irrigation should be given whenever necessary, but growers must not rely on irrigation alone, but should combine it with the thorough cultivation of the land so as to form and keep a fine soil mulch that will prevent surface evaporation.

All newly planted trees should be looked after carefully and only permitted to grow the branches required to form the future tree. All others should be removed as soon as they make their appearance. If there is any sign of woolly aphis, peach aphis, or scale insects, or of any fungus disease on the young trees, these diseases should be dealt with at once by the use of such remedies as black leaf forty, Bordeaux mixture, or a weak oil emulsion. In older trees, similar pests should be systematically fought, as if kept in check at the beginning of the season the crop of fruit will not suffer to any appreciable extent. Where brown rot has been present in previous years, the trees should be sprayed with Bordeaux mixture and lime sulphur according to the schedule recommended by the Department. All pear, apple, and quince trees should be sprayed with arsenate of lead—first when the blossom is falling, and at intervals of about three weeks. Spraying for codling moth is compulsory in the fruit district of Stanthorpe, and wherever pomaceous fruit is grown it must be attended to if this insect is to be kept in check.

In the warmer parts a careful check should be kept for any appearance of the fruit fly, and, should it be found, every effort should be made to trap the mature insect and to gather and destroy any affected fruit. If this is done, there is a good chance of saving the earlier-ripening summer fruit, if not the bulk of the crop. Tomato and potato crops will require spraying with Bordeaux mixture, as also will grape vines. Keep a very strict watch on all grape vines, and, if they have not been treated already, do not delay a day in spraying if any sign of an oil spot, the first indication of downy mildew, appears on the top surface of the leaf. Spraying with Bordeaux mixture at once, and following the first spraying up with subsequent sprayings, if necessary, will save the crop, but if this is not done and the season is favourable for the development of the particular fungus causing this disease, growers can rest assured that their grape crop will not take long to harvest.

Where new vineyards have been planted, spraying also is very necessary, as if this is not done the young leaves and growth are apt to be affected so badly that the plant will die.

THE BRANDING OF STOCK.

The attention of stockowners is directed to the necessity for following the rules of branding, especially in regard to re-branding.

The Brands Act provides that the second or subsequent brander must, if there is room, imprint his brand on his stock at a distance of not less than 1½ inches nor more than 2½ inches from and directly underneath the previous brand.

If there is not room, the re-branding must be done on the next succeeding position, *and on the same side of the animal as the preceding brand in the case of cattle,* thus confining the branding of cattle to one side.

The size of all brands is restricted to not less than 1½ inches in length, or more than 2½ inches in length for horses and cattle.

Owners are advised to note their obligations in these matters, the observance of which will help to lessen the present unnecessary deterioration of hides through excessive and incorrect branding.

Plate 125.

Canefields at Babinda, North Queensland.

Farm Notes

OCTOBER.

CULTIVATORS or scufflers should be kept moving through early-sown raw crops in order to eradicate weed growth and maintain a surface mulch, as much of the summer rains falling on a caked surface soil will fail to penetrate to any great depth. To check losses of soil during summer storms, all raw crops should be sown at right angles to the prevailing slope.

Sowings of maize, sweet sorghums, grain sorghums, sudan grass, millet, cowpea, peanuts, pumpkins, melons, &c., can be continued and sweet potatoes planted out.

Increased attention is being paid to the sweet sorghums such as "Saccaline," both in the coastal areas and on the Downs, in which latter district the crop has been profitably fed to cattle, horses, and sheep.

For the western Downs and Maranoa, farmers are advised to make sowings of sudan grass, which has proved outstanding in recent years as a summer crop, being utilised for grazing, hay, or silage.

An endeavour should be made to reduce the tonnage of feedstuffs annually received from the Southern States, as with the exception of oat grain, and possibly small quantities of prime oaten chaff, local growers should be in a position to cater for State requirements of lucerne, wheaten and oaten chaff, sudan chaff, millet, and panicum chaff, staver, &c.

Some interest is also being taken in the cowpea as a summer growing fodder plant rich in protein, which can be grazed, or converted into hay or silage (in combination with maize or sorghum). Suitable varieties are groit, poona, brabham, and black. October is a an opportune month for the establishment of summer grasses, chiefly paspalum and Rhodes. Paspalum may be broadcast on scrub burns or ploughed land of reasonably high fertility, at the rate of 8-12 lb. seed per acre, adding white clover seed at the rate of 2 lb. per acre. Rhodes grass, which is preferred in districts too dry to support paspalum, may be sown from October to January, the ashes left after the burning of timber on scrub land providing an excellent seedbed.

No useful results are obtained by broadcasting Rhodes or other grasses on uncultivated land other than a scrub "burn," as it is essential to plough or renovate sufficiently to provide cover for the seed. From 4 to 6 lb. of tested seed per acre will usually provide a good stand.

In the wheat areas, hay-making will be in progress where crops are not too far advanced for this purpose. Crops cut a few days after the flowering stage will contain the maximum nutritive value, the nutriment being then spread evenly throughout the plant.

A greater tonnage can be obtained by cutting at a later stage, but only at the expense of feeding value and colour. During periods of scarcity, good quality wheaten chaff realises £7 to £10 per ton.

As harvesting becomes general during November, all necessary machinery should be given a thorough overhaul, in order to avoid stoppages at a critical period.

PEANUT REFUSE FOR DAIRY CATTLE.

In preparing peanut kernels for market, the shells, small particles of kernel, leaf and stalk or root attachments are separated and represent offal.

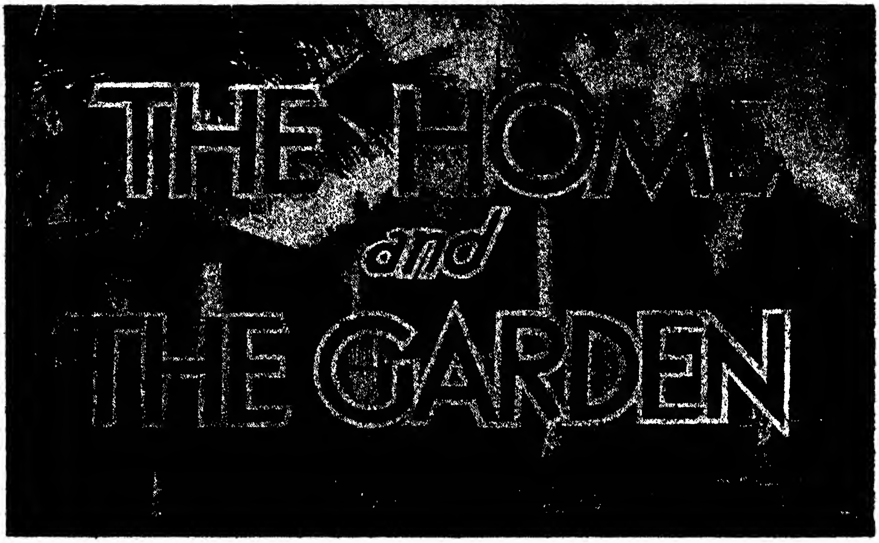
The shells and stalky parts are only low-grade roughage, but when, as often happens, the leaf and kernel fragments form an appreciable part of the bulk, the offal has a feeding value comparable with fair hay.

A sprinkling of water sweetened with molasses induces dairy cattle to eat their fill.

Dairy farmers seeking a cheap source of roughage are recommended to use the abovementioned product of a Queensland industry.

Plate 126.

HIGH TOR.—Mr. G. E. Lawrence's picturesque farm home, built largely of bush timber, at Maleny, Blackall Range, South Queensland.



Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE WORK OF THE BABY CLINICS.

A VERY worried mother with a small boy of two attended at one of our Baby Clinic Sub-centres the other day. The child's condition was such that he had to be referred for medical attention. But most of his troubles could have been prevented by correct diet and attention to simple health rules. The mother had four other children whose teeth were not in good condition and whose development was poor.

"Why have you not come along to the Clinic before?" enquired Sister, feeling so sorry for all these ills that could have been avoided by proper advice earlier on.

"Oh," said the mother, "none of my children have ever been really sick."

So, in spite of the fact that baby clinics have been in existence in Queensland since 1918, there still exists in many places a good deal of misunderstanding as to the real work done by them. I will therefore use my little talk this month to explain all about it.

Many people still think that clinics are institutions to which sick children are brought for advice or treatment. This is not so. If sick children are brought to a clinic they are advised at once to go to a doctor or hospital.

One of the most important objects of the baby clinics is to advise expectant mothers in matters regarding their own health and that of their babies before and after birth. For this purpose, in Brisbane,

antenatal clinics have been established. There are two such clinics; one is held at the Woolloongabba Baby Clinic on Monday evenings and the other at the Valley Baby Clinic on Thursday evenings. A doctor is in attendance. In the country centres where there are no antenatal clinics, but where baby clinics are established, the clinic nurse is prepared to give advice to expectant mothers who may seek her help. That she may be qualified to do this, each nurse must hold an obstetric certificate in addition to general and child welfare certificates. The nurse cannot take the place or do the work of a doctor; but in many matters, including one very important one, the diet of the expectant mother, she is able and willing to advise.

Another of the objects of the clinics is to visit, as early as possible, all mothers of new-born infants in the district in which the clinic is situated. To enable them to do this, the clinics receive lists of new-born infants and the names and addresses of their mothers, and by this means are able to get in touch with the mothers at the time when advice is of most use, that is, when the babies are very young.

The most important piece of advice given to the mother at this time is that she can nurse her baby. The baby who is fed by his own mother is both healthier and happier than the one who is artificially fed. If she has any doubts or difficulties as to the baby's care and management either then or in the future, the clinic nurse will be very pleased to assist her in solving these difficulties. If all the mothers in Queensland knew how much less likely naturally-fed infants are to become sick during their first year there would be far fewer artificially-fed infants.

The clinics cater for more than the baby in arms. The nurses are trained to advise in regard to general care, and especially the correct dieting, of children up to school age. The state of a child's health is dependent very largely on the food he eats. If the food is not right the health, and in particular the teeth, suffer. Reports on the state of the teeth of young children when they first attend school show that sound advice on this matter is badly needed.

You will realise that the work of the clinic nurse consists, not in curing sickness or in treating ailments, but in trying to keep mothers and their children well.

By keeping supervision over the mother-to-be our aim is to safeguard her health in order that she may suffer no disability as the result of the additional strain placed upon her, and that she may give birth to a healthy baby.

By teaching mother's milk for mother's baby we hope to save more infants.

The baby clinic nurse invites healthy mothers and healthy babies to the clinic so that with her specialised knowledge she may supervise the feeding and care of the baby. As the health of the mother is inseparably bound up with that of the child, it follows that the nurse in giving advice in regard to the feeding and care of the baby must advise the mother in regard to the care of her own health.

The objects of baby clinics are:—

To advise expectant mothers in matters regarding their own health and that of their babies before and after birth.

To visit all newborn infants within their districts as far as possible and invite the mothers to visit the clinics.

To encourage the natural feeding of infants as the best method of reducing sickness and mortality during the first year of life.

To help all mothers in the management and feeding of babies and children before school age.

To spread sound knowledge regarding the rearing of healthy children and to discourage all practices calculated to injure their health.

To advise medical or hospital treatment for such cases as may need it.

To educate the women of Queensland in mothercraft so that the next generation may be stronger and happier than the present.

Clinics were first established in Queensland in 1918. They started in Brisbane with four in the metropolitan area, but they have long since extended to the country and there are now twenty-six resident centres. In addition there are seventy-eight sub-centres, making a total of 104 centres supplying a very large area of the State.

There are forty-nine nurses on the Baby Clinic permanent staff and every nurse appointed must hold general, obstetric and child welfare certificates. For, while we do not treat sick babies, the general certificate is necessary so that the nurse is qualified to observe, in either mother or child, signs or symptoms of sickness and need for the patient to be sent on for advice. The nurse's obstetric training and experience in antenatal clinics qualify her here again, to note anything wrong and advise accordingly. She is qualified to give advice as to the diet and general health of the expectant mother. The child welfare training equips her still futher by teaching her to recognise, and be familiar with, the characteristics of the normal baby and healthy child, to know the mental and physical qualities which should be present at a given age, and here again note departures from normal. In each case, whether it be the expectant mother, the nursing mother and her baby, or the toddler, early recognition of abnormal symptoms permits the patient to be sent on to a doctor or hospital at the time when treatment is likely to be most useful, that is, in the early stages of the ailment. Very many cases are sent on in this way from the baby clinics of the State.

Another, and very important, branch of clinic work is the Child Welfare Training Centre which is attached to the Valley Baby Clinic. That the nurse of to-day is alive to the importance of this training, is shown by the number who desire to take this course. Not only in the cities but nurses from far distant parts of the State realise the importance of, and need for, this training. Up to the present about 500 nurses have taken the course and there are thirty now in training.

Our work in the interests of our mothers and children is done by means of our antenatal clinics, which seek to safeguard the health of the expectant mother; our day clinics to which mothers bring themselves and their infants when in doubt or difficulties; our district work which brings us in touch with the mother and her new baby; the railway car which takes the nurses to help the mothers in the distant places; and last but not least, our Welfare Training Centre from which the nurses pass to positions in many parts of the State, and there to carry on and help us in our work.

IN THE FARM KITCHEN.

SOME APPETISING PUDDINGS.

While the weather is still cold, puddings will be a welcome item in the menu. Here are a few tested recipes:—

Jam Layer Pudding.

Take ½ lb. flour, 3 oz. suet, ½ teaspoonful baking-powder, pinch salt, water to mix, jam (without stones).

Mix the flour with the chopped suet, then add salt, baking-powder, and water, sufficient to mix the whole to a fairly stiff paste. Knead lightly and roll out to the thickness required. Grease a basin and put a layer of jam at the bottom. Divide the pastry into four, take a quarter and shape it into a piece to fit the bottom of the basin. Add another layer of jam and continue until the pastry is used up, finishing off with a layer of pastry. Cover with a greased paper and steam for two to two and a-half hours. Turn out and serve at once. No sauce is required.

Marmalade Sauce.

Take ½ pint water, 2 oz. marmalade, 1 oz. sugar, lemon essence or juice.

Mix the ingredients in a small saucepan. Bring to the boil and cook for about ten minutes and serve as required.

Marmalade Pudding.

Take 6 oz. breadcrumbs, ¾ pint milk, 2 oz. sugar, 3 oz. marmalade, 1 oz. butter, 2 eggs, pinch salt.

Heat the milk and pour it over the breadcrumbs. Add the sugar, butter, salt, and marmalade. Whisk the eggs and stir into the mixture. Turn into a buttered mould or basin, cover with buttered paper and steam gently for about one hour. Allow it to stand a minute or two before turning out. Serve very hot with marmalade sauce.

Camp Pudding.

Take 4 oz. breadcrumbs, 2 oz. currants, 2 oz. raisins, 2 oz. chopped mixed peel, 4 oz. sugar, 4 oz. chopped suet, 3 oz. flour, 1 lemon, ½ orange, 2 eggs, milk if required.

Mix all the dry ingredients together, add the juice and rind of one lemon and half an orange. Whisk the eggs and add some milk. Mix all to a fairly stiff consistency. Turn into a greased basin, cover with a greased paper and steam for two hours. Serve with orange or lemon sauce.

Baroness Pudding.

Take 3 oz. flour, 3 oz. suet, 4 oz. raisins, 1 egg, 2 oz. sugar, pinch baking-powder, milk to mix.

Grate the suet, and mix all the dry ingredients together. Stone the raisins and add also. Beat the egg and add and mix with milk. Steam in a mould for three hours.

Devonshire Dumpling.

Take ¾ lb. flour, ¼ lb. lard or suet, 3 oz. sugar, 2 oz. sultanas or currants, 2oz. raisins, chopped fine, or chopped dates, a good pinch of salt, ½ teaspoonful spice, 1 teaspoonful carbonate of soda, enough sour milk to mix a stiff dough.

First sift the sugar, soda, and salt into the flour; then add the other ingredients, mix up quickly with sour milk, put into a greased pudding basin, and steam for three hours. Turn out and serve with white sauce. The dumpling is generally tied in a floured cloth and boiled in this way; but I do not recommend the method, because so much of the fat boils out in the water and is lost. The use of a basin is an economy.

Date Pudding.

Take ½ lb. flour, 3 oz. sugar, 6 oz. shredded suet, 1 orange, 6 oz. quartered stone dates, 2 teaspoonfuls baking-powder, ½ teaspoonful salt, 1 pint custard sauce.

Grease a pudding basin. Sift the flour, salt, and baking-powder into a bowl. Stir in the suet, sugar, dates, grated orange rind, and half the custard sauce. Mix all well together. Turn into a basin, cover with a greased paper, and steam two hours. Turn out on to a hot dish. Mask with the remainder of the custard sauce.

Jam Pudding.

Take 14 oz. flour, 7 oz. shredded suet, 1½ teaspoonfuls baking-powder, pinch salt, 1 lb. jam, water to mix.

Make a dough by adding water to the dry ingredients and mixing them to a soft consistency. Roll a third of this dough into a fairly large round to fit inside the basin. Line basin with the round of dough and make it smooth. Press the dough well up the edge of the basin and on to the rim. Now divide the remaining pastry into portions. These with the jam form the layers. Put jam at the bottom of basin. Fill up the basin with alternate layers of jam and dough, making each layer of dough cover the surface of jam. A layer of dough must be at the top. Cover the basin with a buttered paper and tie on a floured pudding cloth. Steam three hours. Serve piping hot.

Raisin Roly-Poly.

Take 1 lb flour, 1 lb. raisins, ½ lb. shredded suet, salt, and water to mix.

Sift flour and salt into a mixing bowl. Add shredded suet and stir till well mixed. Add sufficient cold water to make a stiff dough and roll into a strip. Stone the raisins and cut in half. Sprinkle these over the dough, wet the edges with water, roll up, and fold in ends neatly. Scald a pudding cloth, sprinkle it with flour and wrap round the pudding. Tie ends of cloth securely, place pudding in a saucepan of fast-boiling water, and boil from two and a-half to three hours. The water must not be allowed to go off the boil during the cooking, and the pudding must be covered with water the whole time. When cooked, remove cloth and serve with custard sauce. Tinned raspberries can be substituted for the raisins—with the juice previously strained off.

Almond Pudding.

Take 4 oz. flour, 2 oz. breadcrumbs, 2 eggs, 3 oz. ground almonds, 4 oz. butter or margarine, 4 oz. castor sugar, 2 oz. glace cherries, 1 level teaspoonful baking-powder, 3 tablespoonfuls milk, a few blanched almonds.

Sieve the flour, ground almonds, and baking-powder. Cream the butter. Mix in the sugar, and beat in each egg separately. Add all the dry ingredients alternately with a little of the milk. Cut the glace cherries into four and add them to the mixture. Blend thoroughly, put sufficient into small, well-greased moulds to three-parts fill them. Cover with greased paper and steam for forty to fifty minutes, according to their size. Just before serving "spike" with a few coarsely-shredded blanched almonds, and serve with chocolate sauce.

SOME MILK RECIPES.

Milk Meringue Jelly.

Take ½ pint milk, 2 egg-whites, 2 tablespoonfuls sherry, ½ pint hot water, 1 packet cherry jelly crystals, angelica, and a few glace cherries.

Dissolve jelly crystals in the hot water, and, when cold, stir in the milk and sherry. Leave until beginning to set, then whisk the egg-whites to a very stiff froth and fold in lightly. Turn into a fancy dish, and when quite set decorate with glace cherries and leaves of angelica.

Milk Solid.

Take 1½ pints milk, ½ lb. granulated sugar, 2 lemons, 1 gill water, 1½ oz. gelatine.

Put the milk and sugar into a saucepan. Add the finely grated rind of the lemons, and when the sugar is dissolved draw aside. Dissolve the gelatine in the water and strain in, stirring all the time. Squeeze the lemons and strain the juice and add. Mix all together, and turn into a wet mould and leave to set. Then turn out carefully, or, if liked, put into a basin. When set break into rough pieces and serve.

Milk Mould.

Take 1¼ pints milk, ¾ gill water, 1 oz. gelatine, vanilla essence to taste, 2 tablespoonfuls desiccated cocoanut, 2 good tablespoonfuls castor sugar, ½ packet lemon jelly crystals, ½ pint hot water, a few glace cherries.

Dissolve the jelly crystals in the hot water, and, when cold, set a thin layer in the bottom of a mould which has been rinsed out with cold water. Decorate it with a few glace cherries, halved and dipped in a jelly. When these are set, cover with some more jelly and set again. Put the gelatine into a saucepan with the water and dissolve slowly. Warm the milk, then strain into the gelatine, stirring well all the time. Turn into a basin, add the sugar and vanilla, and, when the mixture begins to set, add the cocoanut. Mix all together, turn into the prepared mould, and, when set, dip into hot water and unmould carefully. Decorate the dish with the remainder of the jelly chopped up roughly.

Mock Cream.

Take 2½ gills milk, 2 oz. cornflour, 4 oz. butter, 3 dessertspoonfuls castor sugar, vanilla flavouring.

Beat the sugar and butter to a cream. Mix the cornflour to a smooth paste with a little milk. Heat the remainder and stir on to it, then return to the pan and bring to the boil. Cook gently for a few minutes, keeping it well stirred all the time. Draw aside and continue to stir until slightly cool. Then gradually mix in the creamed butter and sugar. Flavour with vanilla and beat all together until creamy. Serve with stewed fruit.

Tea Made With Milk.

Allow 1 good teaspoonful tea to ½ pint milk.

Heat the teapot, bring the milk to the boil, put the tea in the teapot and pour in the boiling milk. Leave for two or three minutes to draw before serving.

Sour Milk Scones.

Take ¾ cupful sour milk, ½ lb. flour, 2 oz. butter or margarine, 1 teaspoonful castor sugar, 1 teaspoonful baking soda, ¼ teaspoonful salt.

Sieve the dry ingredients into a basin. Rub in the butter with the tips of the fingers and stir in enough sour milk to make a stiff dough. Roll out on a lightly-floured board and cut into rounds. Bake for a quarter of an hour in a hot oven.

MARGARINE.

"Margarine was a war product, and had best remain a war product," declared Professor Harvey Sutton, of the School of Public Health and Tropical Medicine, recently. He went on to say that margarine is useful in an emergency when better materials cannot be obtained. In Australia, where the best quality butter is available to everyone, margarine is out of place, especially in the feeding of children.

TO SUBSCRIBERS.

Kindly renew your subscription without delay. Write your full name plainly, preferably in block letters. PLEASE USE THE ORDER FORM, which will be found on the last page of each issue.

Address your subscription to the Under Secretary, Department of Agriculture and Stock, Brisbane.

THE GARDEN COMPOST HEAP.

The garden compost heap is a cheap means of converting garden and household vegetable refuse into valuable fertilizing material. Materials such as lawn clippings, spent crops, free of disease, and vegetable tops should be used in this way, but the coarse, woody stalks of strong-growing plants should be avoided.

The production of artificial manure from garden waste, straw, &c., depends on the decomposition, by fungi and bacteria, of much of the plant material. The rapidity with which the process goes on is influenced by the type of material, its degree of maturity, and chemical composition, and by the presence of nutrients, such as lime, phosphate, nitrogen, and potash, for the organisms carrying on the decomposition are much akin to plants in their requirements.

Actual damage can be done to crops, other than some legumes, by the addition of uncomposted, poor-quality material to the soil. Such materials as bush scrapings, dry mature grass or straw, offer a good source of energy for the soil bacteria and fungi, which rapidly increase in numbers, and in so doing consume some of the available nitrogen. This competition between the plant and the soil organisms for soil nitrates may result in the nitrogen starvation of crops.

The usual process of allowing plant refuse to decay, without any chemical treatment, results in a very acid product. With plant residues containing little nitrogen and phosphate, it is necessary to add available nitrogen to the heap, as well as lime (which prevents the development of acidity) and phosphate (which is required in the nutrition of the organisms). With materials rich in nitrogen and minerals, such as legumes (peas, beans, &c.,), green vegetable tops, and other green succulent material, the use of lime alone should be sufficint to ensure rapid decomposition.

With general refuse or poor-quality material, a heap can be made on a square base and of such size that the final height is about 3 feet. The chopped up material should be spread in layers several inches deep, each layer being treated in the following way:—

Snow over with ground limestone (5 lb. per 100 lb. of material), fork in loosely, give a sprinkling of superphosphate, and then add sulphate of ammonia at the rate of 1½ lb. per 100 lb. material. The material should be moistened before building up the layers, if not already moist. Ammonia will be given off slowly, so that it is necessary to keep building up and treating the successive layers quickly, so that the loss will be kept at a minimum. The final layer is not treated, and may be given a covering of an inch of soil. When next the heap is added to, the untreated layer can be moistened and treated.

When the heap is at the full height, after subsidence due to compaction and bacterial action, the untreated capping can be used as a base for the next heap. The heap should be kept damp, but the amount of water used should not cause drainage from the heap.

In summer the material should be ready for use after two months, but in colder weather the process is much slower.

Properly prepared compost manure is very similar in chemical composition to horse manure, and gives equally good results in promoting plant growth.

A GATELESS OPENING.

In many places it is desirable to have an opening in the fence that a man can easily slip through without bothering with a gate, but through which horses or cows cannot pass. Four posts are set as shown—two in the fence line, which should be braced, and one on each side of one of the centre-line posts. Branch wires are carried from the other centre-line post to the two sideposts. These should be made

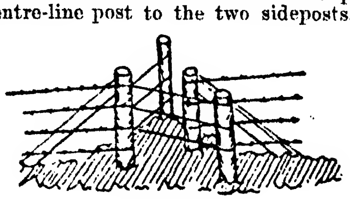


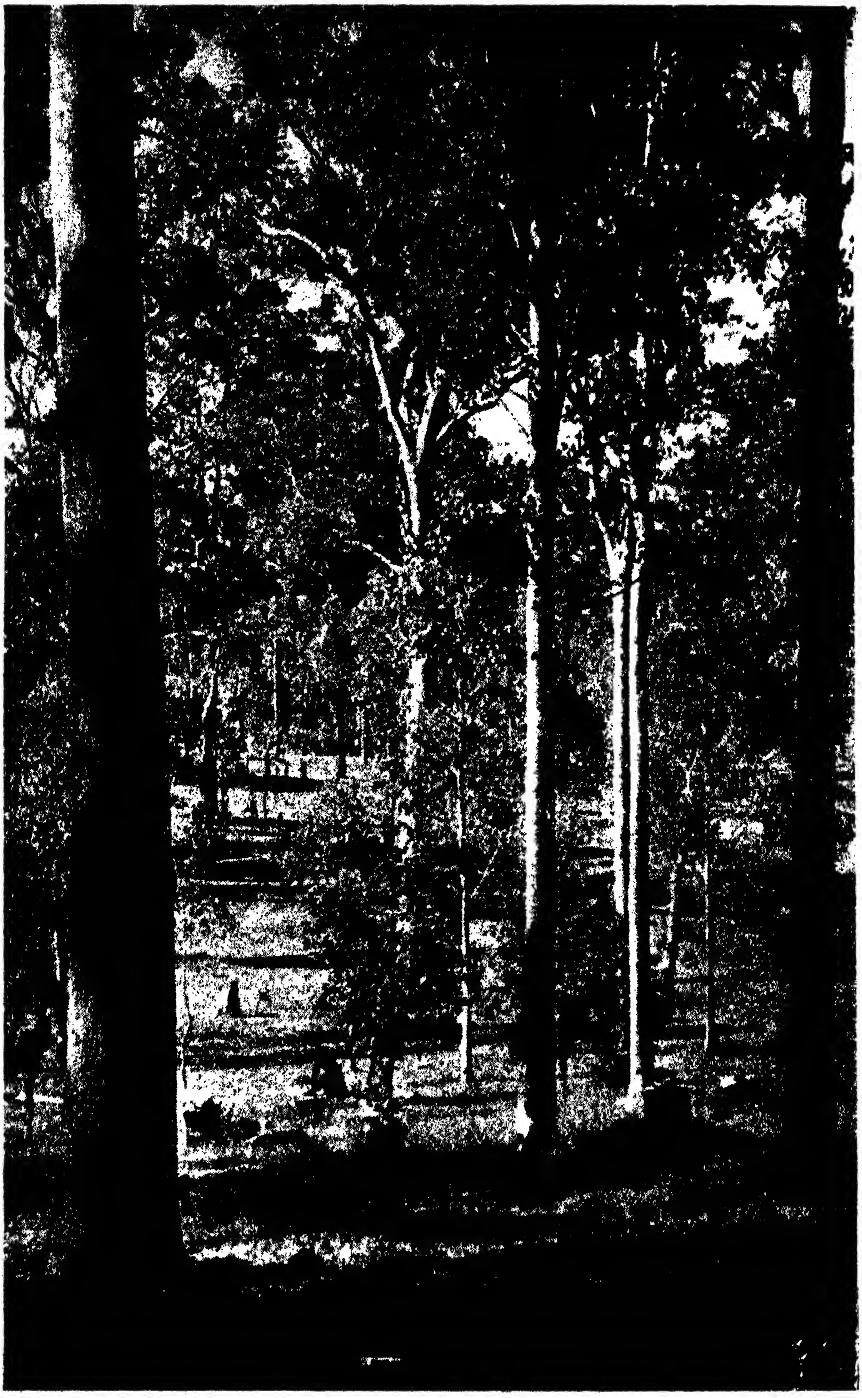
Plate 127.

of wire without barbs to catch on the clothes, as it is not desirable to make the openings larger than necessary. If the centre posts are long enough—say, 5½ or 6 ft. above the ground—they can be braced to each other by a piece of strap iron across the top. If this is possible, then the other braces will not be necessary.

[*Photo. by courtesy of "The Telegraph."*

Plate 128.

A Young Hardwood Stand after Forestry Treatment.—Observe the park-like appearance, each tree being well spaced.



[Photo.: "The Telegraph."

Plate 129.
A shadowed glade in a young hardwood forest.

National Radio Talks.

The following programme of national talks, supplied by courtesy of the Australian Broadcasting Commission, will be given over the national network of broadcasting stations, which includes:—

2BL, 2NR, 2CO, 3AR, 3GI, 4QR, 4RK, 4QN, 5AN, 5CK, 7ZL.

All times stated are *Eastern Standard Time.*

SUNDAYS.

9.30 to 9.45 a.m.

SPECIAL NATIONAL TALK FOR COUNTRYMEN—relayed over the alternative network and all regional stations, i.e., 2FC, 2NR, 2NC, 2CR, 2CO, 3LO, 3GI, 3WV, 4QR, 4RK, 4QN, 5CL, 5CK, 7ZR, on the first Sunday in every month.

SEPTEMBER.

4th—

"*The Improvement and Management of Pastures.*" By Professor A. E. V. Richardson (Melbourne).

OCTOBER.

2nd—

"*The Scientific Aspect of Grass Lands.*" By Dr. H. C. Trumble (Adelaide).

10.15 to 10.30 a.m.

(South-Eastern Queensland tune to 4QG for this session.)

Review of CURRENT BOOKS WORTH READING.

This talk is given on alternate Sundays by Mr. Vance Palmer from Melbourne and Mr. Hector Dinning from Brisbane.

3.0 to 3.20 p.m.

"AN ARMCHAIR CHAT." By Mr. F. S. Burnell (Sydney).

6.30 to 6.45 p.m.

"SCIENCE IN THE NEWS." By Professor W. J. Dakin (Sydney).

SEPTEMBER.

4th September and on every second Sunday thereafter.

On the alternate Sundays the Talks will be as follow:—

11th—

"*The Auld Hoose.*" By Mr. William Tainsh (Melbourne).

25th—

"*The First Englishman—Dampier.*" By "Observer" (Melbourne).

OCTOBER.

9th—

OUR NATIONAL DEBT" (Series)—"*Our Debt to Antiquity; Judea, Greece, Rome.*" By Professor Walter Murdoch (Perth).

23rd—

"OUR NATIONAL DEBT" (Series)—"*Our Debt to Modern Nations; France, Italy, Germany.*" By Professor Walter Murdoch (Perth).

NOVEMBER.

6th—

"*Talk.*" By Mr. Don. Bradman (Adelaide).

20th—

"OUR NATIONAL DEBT" (Series)—"*Our Debt to Britain.*" By Professor Walter Murdoch (Perth).

8.30 to 8.50 p.m. every Sunday—INTERNATIONAL AFFAIRS:

On the following dates the Talks in this series will be given by Mr. H. V. Hodson, the well-known B.B.C. Foreign Affairs commentator: 28th August, 18th and 25th September, 2nd, 9th, and 23rd October.

MONDAYS.

7.40 to 7.55 p.m.

SEPTEMBER.

5th—

Talk by a delegate to the British Commonwealth Relations Conference.

"SOME WORLD ECONOMICS" (Series). By Mr. H. V. Hodson, well-known English economist and Foreign Affairs commentator for the B.B.C.

12th—

"*The Future of World Trade and Empire Trade.*" (Sydney).

19th—

"*Rearmament and the Future of Industry.*" (Sydney).

26th—

"*The Future of Population and Migration.*" (Sydney).

OCTOBER.

3rd—

"*The Future of Gold and Money.*" (Melbourne).

10th—

"HEINRICH HERTZ—AN IMAGINARY INTERVIEW IN 1888." By Professor A. D. Ross (Perth).

(In the year 1888 Hertz discovered electro-magnetic waves.)

"MEN TALKING."

On 17th October and on subsequent Monday evenings at 7.40 to 7.55 p.m., instead of a National Talk, there will be a new feature—"*Men Talking.*" Listeners are invited to eavesdrop.

TUESDAYS.

7.40 to 7.55 p.m.

Every Tuesday "THE NEWS BEHIND THE NEWS" by the Watchman." During September, while "The Watchman" is on holiday, this talk will be given by one of the delegates to the British Commonwealth Relations Conference.

Also on Tuesday evenings, some time between 9.0 and 10.0 p.m., there will be a talk of a light nature. Those arranged for September are as follow:—

SEPTEMBER.

6th—

10.0 to 10.15 p.m.: Talk by Mr. S. K. Ratcliffe (Melbourne).

13th—

9.45 to 10.0 p.m.: *"I Put My Swag Up."* By Mr. G. F. Young (Melbourne).

20th—

9.25 to 9.40 p.m.: To be arranged.

27th—

10.0 to 10.15 p.m.: To be arranged.

WEDNESDAYS.

7.40 to 7.55 p.m.

"THIS CHANGED THE WORLD" (Series). The last two talks in this series. By Sir Henry Barraclough (Sydney).

SEPTEMBER.

7th—

"Steam."

14th—

"Electricity."

"GREAT AUSTRALIANS" (Series). *"And Still They Live."*

21st—

"William Charles Wentworth." By Dr. A. C. V. Melbourne (Brisbane).

28th—

"The Hon. Henry Bournes Higgins." By Professor G. V. Portus (Adelaide).

OCTOBER.

5th—

"Sir John Forrest." By Dr. J. S. Battye (Perth).

"MAKERS OF AUSTRALIAN PROSPERITY" (Series). By Mr. Brian Fitzpatrick (Melbourne).

12th—

"Thomas Sutcliffe and James Harrison."

19th—

"John Ridley."

26th—

"H. V. McKay."

"IN THOSE EARLY DAYS" (Series). By Professor Ernest Scott (Melbourne).

NOVEMBER.

2nd—

"The First European Woman in Australasia."

9th—

"Betsy Balcombe and a Lock of Napoleon's Hair."

16th—

"Abel Tasman."

"SCALLYWAGS OF THE SEVENTIES" (Series). By Mr. Frank Clune (Sydney).

23rd—
"Bully Hayes."

30th—
"De Rougemont."

DECEMBER.

7th—
"Henry Retford."

"PENAL STATIONS OF OLD VAN DIEMEN'S LAND" (Series). By Mr. W. H. Hudspeth (Hobart).

14th—
"Macquarie Harbour and Maria Island."

21st—
"Port Arthur."

28th—
"Tasman Peninsula."

THURSDAYS.

7.40 to 7.55 p.m.

SEPTEMBER.

8th—
Talk by Delegate to the British Commonwealth Relations Conference.

15th—
Talk by Delegate to the British Commonwealth Relations Conference.

"THREE TALKS" (Series). By Dr. F. W. Whitehouse (Brisbane).

22nd—
"What Became of Leichhardt?"

29th—
"The Dawn of Life in Australia."

OCTOBER.

6th—
"Red Sand and White."

"POPULAR SCIENCE" (Series). By Dr. S. W. Pennycuick (Adelaide).

13th—
"Why Do We Take Ourselves So Seriously?"

20th—
"Little Drops of Water."

27th—
"The Greatest Workers in the World."

NOVEMBER.

3rd—
"The Strange Adventures of Mr. Carbon."

"AUSTRALIAN READERS AND WRITERS" (Series). By Mr. Frank Dalby Davison (Sydney).

10th—
"Revealing a Continent."

17th—
"Australia the Heroine."

"I WONDER" (Series). By Professor G. V. Portus (Adelaide).

24th—
"What the Scientists Will Do Next."

DECEMBER.

1st—
"Whether We Really Have Progressed."

8th—
"If Seeing is Believing."

15th—
"Whether Intelligence is Enough."

"The NORTHERN TERRITORY" (Series). By Mr. E. Southwell-Keely (Sydney).

22nd—
"People and Personalities of the Far North."

29th—
"Our Northern Territory—I Have Lived There."

FRIDAYS.

7.40 to 7.55 p.m.

Every Friday evening a National Talk will be broadcast. This period is kept free as late as possible so that any talks by outstanding visitors or on topical subjects may be arranged at short notice.

SEPTEMBER.

2nd—
To be arranged.

9th—
"Some Peculiar Ways in America." By Colonel Boris Alexander, of the University College, Memphis, Tennessee (Melbourne).

16th—
To be arranged.

23rd—
"Some Unwelcome Immigrants." By Professor A. E. V. Richardson (Melbourne).

FRIDAYS.

Occasional National Talks of a light nature on Friday evenings, somewhere between 9.0 and 10.0 p.m., will be broadcast. During September the following Talks have been arranged:—

SEPTEMBER.

2nd—
9.30 to 9.45 p.m.: *"This Was News."* By Mr. L. Cerutty (Hobart).

16th—
9.0 to 9.15 p.m.: *"Where Did You Get That Accent?"* By Mr. John Horner (Adelaide).

WEDNESDAYS AND FRIDAYS.

6.0 to 6.15 p.m.

"YOUNG PEOPLE TAKE THE AIR."

Talks or discussions by young people on subjects of interest to young people.

During September the subject of the talks will be Professor Walter Murdoch's suggestions for "An Australian Creed."

SATURDAYS.

8.50 to 9.0 a.m.

"THE BIRDS IN YOUR GARDEN" (Series). By Mr. M. S. R. Sharland (Sydney).

On Saturdays during September these talks will be heard from the following stations: 2BL, 2NR, 2CO, 3AR, 3GI, 7ZL.

9.30 to 9.50 a.m.

"YOUR HOBBIES."

The young people's "Hobbies Session" every Saturday morning.

HANDY BAG NEEDLE.

A bodkin or needle suitable for sewing up bags can be made easily from an ordinary sardine tin-opener. The wire opener is straightened out, as illustrated, and

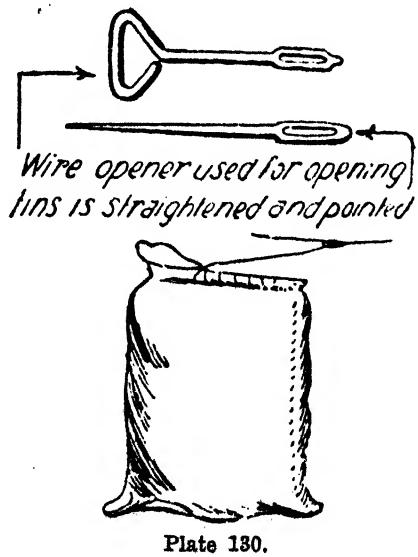


Plate 130.

the ends rounded with a file or a grindstone, so that they may pass freely through the open weave of the sacking.

Water Conservation on the Condamine.

Plate 131. [*Photo.: Lands Department.*
Reilly's Weir.

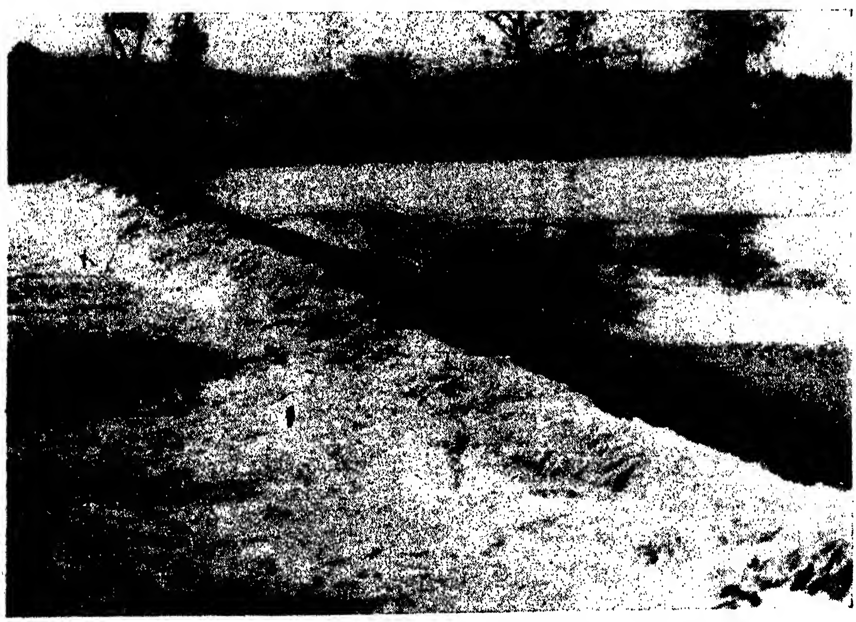


Plate 132. [*Photo.: Lands Department.*
The weir filled to capacity.

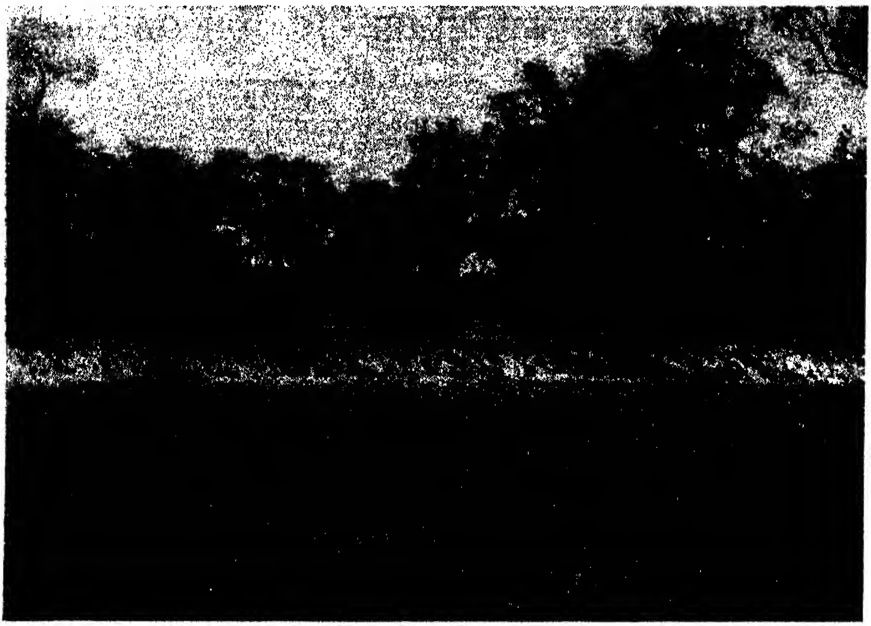


Plate 133. [Photo.: Lands Department.

The catchment.

Plate 134. [Photo.: Lands Department.

Access road to Bingil Bay, near Mourilyan, North Queensland.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of July, in the Agricultural Districts together with Total Rainfall during 1938 and 1937, for Comparison.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	July.	No. of years' records.	July, 1938.	July, 1937.
North Coast.	In.		In.	In.
Atherton	1·09	37	2·82	3·44
Cairns	1·57	56	1·99	3·66
Cardwell	1·37	66	2·66	2·08
Cooktown ..	0·96	62	0·71	1·12
Herberton ..	0 87	52	2·37	1 66
Ingham	1·63	46	4·58	2·75
Innisfail	4·75	57	8·17	10·62
Mossman Mill ..	1·31	25	2·20	2·71
Townsville ..	0·61	67	3·68	0·62
Central Coast.				
Ayr	0·67	51	3·30	0·37
Bowen	0·92	67	2·61	0·47
Charters Towers ..	0·63	56	1·91	0·43
Mackay	1·67	67	3·03	0·90
Proserpine ..	1·54	35	2·68	1·25
St. Lawrence ..	1·38	67	1·68	0·51
South Coast.				
Biggenden ..	1·37	39	3·24	0·90
Bundaberg ..	1·84	55	4·29	1·60
Brisbane	2·22	86	1·43	1·15
Caboolture ..	2·15	51	2 04	0·73
Childers	1·70	43	2 98	2·08
Crohamhurst ..	2 95	45	3·21	1·42
Esk	1 95	51	2·86	0·65
Gayndah	1 46	67	2 67	1·45
Gympie	2·09	68	2·44	0·96
Kilkivan	1 59	59	2·35	0·69
Maryborough ..	1·92	67	3 98	2·54
Nambour	2·67	42	3·99	2·12
Nanango	1·65	56	3·29	0·95
Rockhampton ..	1 77	67	2·65	1·89
Woodford ..	2 34	51	2·64	0·61
Central Highlands.	In.		In.	In.
Clermont ..	1·04	67	2·80	0·80
Gindie	1·11	39	..	0·14
Springsure ..	1·21	69	0·71	0·43
Darling Downs.				
Dalby	1·73	68	2·19	0·97
Emu Vale ..	1·60	42	1·50	0·88
Hermitage ..	1·72	32	..	0·74
Jimbour ..	1·53	50	1·91	0·86
Miles	1·65	53	1·47	0·86
Stanthorpe ..	2·04	65	1·74	0·90
Toowoomba ..	2·09	66	2·30	1·08
Warwick ..	1·84	73	1·34	0·82
Maranoa.				
Roma	1·47	64	0·34	0·60
State Farms, &c.				
Bungeworgoral ..	1·41	24	..	0·72
Gatton College ..	1·41	39	1·32	0·98
Kairi	..	..	..	..
Mackay Sugar Experiment Station	1·48	41	..	0·50

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JULY, 1938.

Compiled from Telegraphic Reports.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·96	77	66	82	24, 25, 29	60	1	71	6
Herberton	..	70	50	82	22, 24, 25	34	5	237	6
Rockhampton	30·09	70	54	80	21, 22	45	5, 31	205	10
Brisbane	30·11	66	50	73	18	45	28	143	12
Darling Downs.									
Dalby	30·14	63	43	69	17, 18, 19	30	2	219	10
Stanthorpe	..	56	36	69	27	23	1	174	10
Toowoomba	..	59	42	67	17	33	1	230	14
Mid-Interior.									
Georgetown	30·00	79	60	88	23, 24	43	5	179	4
Longreach	30·09	72	46	83	22	35	4	132	3
Mitchell	30·14	65	39	74	23	28	5	55	3
Western.									
Burketown	30·04	78	57	91	22	43	5	61	2
Boulia	30·09	72	48	87	19, 20	30	4, 5	85	3
Thargomindah	30·12	64	43	77	19, 20	33	16, 17	36	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	Sept., 1938.		October. 1938.		MOONRISE. Sept., 1938.	MOONRISE. Oct., 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·7	5·37	5·34	5·51	10·21	10·39
2	6·6	5·37	5·33	5·51	11·11	11·33
					p.m.	p.m.
3	6·5	5·38	5·32	5·52	12·1	12·24
4	6·4	5·38	5·31	5·52	12·49	1·16
5	6·3	5·39	5·29	5·53	1·40	2·8
6	6·2	5·39	5·28	5·53	2·33	3·2
7	6·1	5·40	5·27	5·54	3·26	3·56
8	5·58	5·40	5·25	5·54	4·17	4·53
9	5·57	5·41	5·24	5·55	5·12	5·48
10	5·56	5·41	5·23	5·55	6·6	6·48
11	5·55	5·42	5·22	5·55	7·2	7·49
12	5·53	5·42	5·22	5·56	7·59	8·50
13	5·52	5·43	5·21	5·56	8·57	9·52
14	5·51	5·43	5·20	5·57	9·57	10·52
15	5·50	5·44	5·19	5·57	10·57	11·46
16	5·49	5·44	5·18	5·58	11·58	..
						a.m.
17	5·48	5·45	5·17	5·59	..	12·35
					a.m.	
18	5·47	5·45	5·16	5·59	12·56	1·21
19	5·45	5·45	5·14	6·0	1·49	2·4
20	5·44	5·46	5·13	6·1	2·39	2·45
21	5·43	5·46	5·12	6·1	3·25	3·25
22	5·42	5·47	5·11	6·2	4·6	4·3
23	5·41	5·47	5·10	6·2	4·48	4·43
24	5·40	5·47	5·9	6·3	5·30	5·25
25	5·39	5·48	5·8	6·4	6·9	6·10
26	5·38	5·48	5·7	6·4	6·48	6·50
27	5·37	5·49	5·7	6·5	7·32	7·42
28	5·36	5·49	5·6	6·5	8·19	8·31
29	5·35	5·50	5·5	6·6	9·2	9·22
30	5·34	5·50	5·4	6·6	9·50	10·11
31			5·4	6·7		11·7

Phases of the Moon, Occultations, &c.

2nd Sept.	☽ First Quarter	3 28 a.m.
10th ,,	○ Full Moon	6 8 a.m.
17th ,,	☾ Last Quarter	1 12 p.m.
24th ,,	● New Moon	6 34 a.m.

Perigee, 20th September, at 10.0 p.m.
Apogee, 5th September, at 3.0 a.m.

The Moon, a narrow crescent, will pass Venus at 7 p.m. on the 27th, at a distance of 4 degrees. The Moon will set about 9.10, and Venus 10 minutes earlier.

Mercury rises at 5.37 a.m., 30 minutes before the Sun, and sets at 5.9 p.m., 28 minutes before it, on the 1st; on the 15th it rises at 5.0 a.m., 50 minutes before the Sun, and sets at 4.22 p.m., 1 hour 22 minutes before it.

On the 11th Venus, our radiant Evening Star, will attain its furthest distance east of the Sun—46 degrees—and after that begin to decline in altitude; but before it disappears we shall see it at its greatest brilliancy, *in about a month hence, and again when it appears as the Morning Star at the end of the year.* On the 15th it rises at 7.42 a.m., 1 hour 52 minutes after the Sun, and sets at 9.8 p.m., 3 hours 24 minutes after it.

Mars rises at 5.34 a.m. on the 1st and sets at 4.40 p.m.; on the 15th it rises at 5.4 a.m. and sets at 4.26 p.m.

Jupiter rises at 4.31 p.m. on the 1st and sets at 5.45 a.m.; on the 15th it rises at 3.29 p.m., and sets at 4.43 a.m.

Saturn rises at 8.28 p.m. and sets at 8.8 a.m. on the 1st; on the 15th it rises at 7.26 p.m., and sets at 7.18 a.m.

Before Venus sets, soon after 8 o'clock, about the middle of the month we can trace the path of the planets from due east to due west by Saturn, Jupiter, Beta Scorpii, the brightest star in the head of the Scorpion; by Alpha Librii, a second-magnitude star in Libra, and by Venus and Spica, the clear white star in Virgo.

At 8 p.m. at the beginning of the month the Southern Cross reaches its greatest distance—30 degrees—west of the south celestial Pole and will be horizontal as at III on the clock-face. Six hours later, position VI, it will be below the horizon in Queensland.

1st Oct.	☽ First Quarter	3 6 p.m.
9th ,,	○ Full Moon	7 37 p.m.
16th ,,	☾ Last Quarter	7 24 a.m.
23rd ,,	● New Moon	6 42 p.m.

Apogee, 2nd October, at 9.0 p.m.
Perigee, 16th October, at 6.0 p.m.
Apogee, 30th October, at 5.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.

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Event and Comment

Rural Development.

PROVISION for the co-ordination of the agricultural interests of the State is the main purpose of the Rural Development Transfer and Co-ordination of Powers Bill introduced in the present session of Parliament by the Minister for Agriculture and Stock, Hon. Frank W. Bulcock. In the course of his speech on the initiation of the measure, the Minister said that it had been evident for the past few years that the State had entered on its third phase of agricultural development.

The first phase was the pioneering phase, when to produce a crop was equivalent to the selling of it. In those days no consideration was given to the amount of labour involved in its production. Later came the application to rural industry of science in its various forms, and for a time agriculture made satisfactory advances in the Commonwealth and the world generally. But in the disastrous post-war period a new aspect of agriculture developed—economic agriculture—which became necessary because it had been demonstrated conclusively on the

markets of the world that cultivation and production, plus science, did not give everything that was required; hence the development of the economic phase of agriculture, involving the disposal of the crop in the most satisfactory market.

Mr. Bulcock went on to say that the question of economic agriculture became more acute with the passing of the years. Economic nationalism meant that the country that adopted it said in effect, "Let us produce our own requirements within our own territory." There were some who thought that this would be a passing phase of economic reconstruction, but, unfortunately, that assumption was wrong, and it could be said reasonably—figures supported the assertion—that economic nationalism was a more potent factor in national life to-day than ever before. Economic nationalism obviously meant contracted markets. For the last four or five years a considerable amount of the time of Parliament had been devoted to a discussion of the implications of trade treaties, quotas, restrictions, and rationing of markets. Things undreamt of ten years ago had come within the range of practical politics and were now accomplished facts. Restrictions, quotas, and import duties seemed to be established practices in the economic and social structure of many countries. It was obvious that the old days of indiscriminate production of primary commodities had passed, and rural organisation had to be moulded in such a way as to fit in with the altered conditions. If there was to be planned agriculture on the production side, there must be planned marketing as well.

Various methods had been adopted in an endeavour to overcome the many difficulties surrounding agriculture. They had, for example, the butter stabilisation plan, to which there could be no soundly based objection. In Biblical law the labourer is worthy of his hire, and if they were to maintain an Australian standard of living, it should not be applied to one, two, or three sections of the community, but be of general application to all sections. Hence right-thinking people throughout Australia readily agreed that it was desirable that they should have such a stabilisation scheme.

A stabilisation scheme was essentially different from a bounty scheme. When the bounties paid from time to time by the Commonwealth Government were reviewed, the conclusion was inescapable that many of them were paid because uneconomic and uncontrolled production in years gone by had caused an uneconomic situation at the marketing end. Consequently, the taxpayer was required to make a contribution for the purpose of enabling people overseas to obtain foods at a low market level, and for which otherwise there might be no market at all. Sooner or later the giving of bounties to industries for export might have to be discontinued because bounties are paid out of consolidated revenue and must therefore ultimately be paid by the taxpayer. Uneconomic agriculture involved a tremendous direct financial burden, and could not be continued indefinitely. A resolution was carried at the

last meeting of the Australian Agricultural Council that no bounty should be paid to any agricultural industry unless it was justifying its existence by taking advantage of modern methods and doing everything within its power to promote efficiency, so that in the course of time it would become a self-supporting industry. That view was not only the view of the Commonwealth Government, but the view, also, of responsible agricultural authorities throughout the Commonwealth.

On the other hand, agriculture must not be allowed to decay. He believed that the only title to land is its application to its economic use. "You must either use it or lose it." It became necessary, therefore, to endeavour to determine the best economic use for the lands of our State. It was obvious that our present system of production was capable of a great deal of improvement.

Probably, one of the most serious problems concerning the people was the preservation of their agricultural status, and that depended on economic land utilisation.

Continuing, Mr. Bulcock said, *inter alia,* that under the Bill finance, which had not been readily available to the land industries of the State, would be made so, and would be distributed more scientifically than in the past. The Crown would be able to give an impetus to industries worth developing. The measure was designed to co-ordinate the State's rural financial policy by bringing it under one control. A Rural Development Board, consisting of representatives of the Department of Agriculture and Stock, the Department of Public Lands, and of the Treasury, would be constituted. The Agricultural Bank would be dissolved and its business carried on by the Bureau of Rural Development. Provision had been made for a sinking fund. The corporation would be a local body under the Local Bodies' Loans Guarantee Acts, which would give it certain borrowing powers.

The bureau would administer all rural loans. Its powers would be so extensive that it would deal with fodder conservation, water conservation, irrigation, and all related agricultural practices.

The provisions enunciated were the provisions of a Bill that the position of agriculture in this State made necessary. The necessity of co-ordinating activities and services had plainly arisen. They could make conjointly, through the Department of Public Lands and Department of Agriculture and Stock, a more material contribution to the wellbeing of agriculture and stock-raising than if they continued to work as separate units. The final instrument of co-ordination between these two Departments was obviously the corporation which it was now proposed to set up, representing as it did, agriculture on the one hand and lands administration on the other. There was a certainty then that there would be not only a continuity of policy but a co-operative policy as between those two important Departments.

The Control of Banana Rust Thrips.

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(*Continued from p. 316, Part 3, Vol. L.—Sept., 1938.*)

X. CONTROL EXPERIMENTS.

(1) Basis for Experimental Work.

In arriving at a basis for control experiments many factors were taken into account. The fundamental relationship between host plant and insect pest suggests that some form of bunch treatment might be economically practicable. Previous investigators, viz., Girault (1925), Froggatt (1927, 1928), Weddell (1932, 1933) and Smith (1934), had accumulated a considerable amount of information on the subject from which it appeared that bunch protection with hessian bags and with fumigant or contact dusts was particularly worth detailed investigation.

As the crop is for the most part grown on hillsides of varying steepness, but generally of considerable ruggedness, the use of power-propelled or horse-drawn appliances is impracticable. This ruggedness also sets definite limitations to the weight of insecticidal apparatus which a man can carry and operate with reasonable comfort and rapidity.

The period of maximum thrips activity coincides with the wet season, when the rainfall is often 10-15 inches per month and frequently torrential in nature. Insecticides must, therefore, be applied to the bunch fairly frequently. As water is seldom readily available on the plantation, the relatively cumbersome sprays were eliminated from the control experiments.

The irregular distribution of the insect and the impossibility of predicting accurately the probable intensity of infestation on any plantation necessitated the wide scattering of experimental plots throughout the various districts. Only those insecticides available on the Queensland or Australian markets were used. As the financial returns to the grower were very low at the commencement of the work, the cost of probable control measures had to be carefully considered.

After reviewing the whole position it was decided that:—

(1) The experimental sites should be located in as many different centres as possible;

(2) Bunch treatment should comprise the major portion of the experimental programme which would naturally be put into operation during the spring, summer and autumn;

(3) Insecticidal dusts either alone or in conjunction with bags should be exploited in control work;

(4) The question of the efficacy of bagging alone as a means of control should be thoroughly investigated; and

(5) Other forms of control should be studied in conjunction with the main experimental programme as time and opportunity permitted.

(2) General Experimental Technique.

(*a*) *Selection of Experimental Sites.*—Experimental sites were selected to conform as far as possible with the following requirements:—

(i.) The plantation must be in reasonably good condition and likely to produce fruit of at least good average quality;

(ii.) Plant development must be such as to ensure a sufficiency of newly-thrown bunches during the experimental period;

(iii.) The plantation should have previously experienced severe rust or, if a young plantation, either be in close proximity to a badly affected area or show a considerable thrips infestation fairly early in the spring, in order to ensure a reasonable chance of severe rust incidence;

(iv.) The plantation must be reasonably accessible in even the wettest weather.

These criteria were not always satisfied because, in the period of decline of an epidemic, it is difficult to determine the probable peak thrips population in any plantation. In both the 1933-34 and 1934-35 seasons, one experimental plot was of little value owing to the slight rust incidence which developed. However, some of the plots were among the most acutely infested in the several districts.

(*b*) *Marking of Bunches.*—Bunches were marked by attaching to the stalk or the base of one of the leaves a card of white millboard about 8 inches by 6 inches, lettered and numbered conspicuously with Indian ink and water-proofed by dipping in a bath of molten paraffin. The cards were suspended by about 2½ feet of string and were usually readily visible at a considerable distance. To facilitate the location of experimental bunches the position of each was plotted on a chart of squared paper.

This method of marking bunches proved very successful. The cards withstood the exposure so well that some were used for three seasons. The chart enabled the experimental bunches to be located quite easily, despite their random distribution over a large area.

Where necessary, a block of plants was conveniently marked by attaching cards to corner plants and also at intervals along the sides.

(*c*) *Arrangement of Experimental Material.*—In most experimental areas, the bunches were distributed at random throughout the plantation or part of the plantation. That is to say, the single plant was treated as a plot, the plots were scattered irregularly throughout the experimental area (the selection of a plant at any time being determined by its stage of growth) and the various treatments were allotted at random to the selected bunches. The actual procedure consisted of pursuing a more or less regular course up and down the rows within the prescribed area and, when a bunch at the correct stage of development was encountered, determining the treatment by the random selection of a lettered disc or label. The number of bunches at the right stage of development on any one day was strictly limited. As it was desirable to include bunches thrown at varying times throughout the period of marked insect activity, a certain number of bunches were selected for treatment on the occasion of most of the weekly visits.

The use of row plots suitably replicated as an alternative experimental method was considered impracticable on account of (1) the considerable variation in plant development, especially on plantations after the first cut and (2) the limited period of the year during which control measures must be applied. To ensure a comparable number of suitable bunches being available for each treatment on each selection day would have necessitated plots of unwieldy size and a prohibitive number of replications.

Where bunch treatment was the sole object of the experiment the unit plant plot was employed. In the case of whole plant treatment, plots of 100 or more plants were used, the same treatment being applied to all plants in the plot. The outside three or four rows were regarded as buffer rows and were not used in assessing the results. The control plants were selected outside the treated plot.

When field experiments were carried out on more than one plantation in any season, the various treatments were divided between the plantations in such a manner as to give the maximum number of comparisons between them.

(*d*) *Materials Used.—Bags.*—Bags were made to the special measurements 45 inches long by 27 inches wide. They were large enough to accommodate all but extremely big bunches, a type not encountered on any of the nine plantations on which experimental work was carried out.

Two grades of hessian were used in the manufacture of bags. The better quality was 11 oz. sugar hessian, a close mesh material which is, however, fairly light. The second quality was 10 oz. hessian which possesses a more open texture. The former had been advocated by certain growers in the Gympie district and had figured in previous experimental work carried out by Weddell (1932, 1933). The latter was tried only in the fourth season's experiments in an endeavour to reduce the cost of control measures.

Cloaks.—In the 1934-35 and the 1935-36 seasons, 11 oz. sugar hessian bags, which had been used on one bunch during the previous season, were cut along the bottom and one side for use as cloaks. Such cloaks measured 54 inches by 45 inches. In the 1936-37 season portions of the new second quality hessian, approximately 36 inches square, were used for this purpose. Although the once-used better quality material had deteriorated to a certain extent, it still remained closer-meshed than the new second quality hessian.

Nicotine Dust A.—This dust had a nicotine content of 2 per cent., as nicotine sulphate. The supplies procured varied enormously in appearance and physical properties. Never particularly good, the dust deteriorated into a thoroughly inferior product. In most samples a considerable proportion of the dust particles became aggregated into lumps which were difficult to break up satisfactorily. The dust was discarded after the first season's work.

Nicotine Dust B.—The nicotine content in early supplies of this dust varied considerably but was generally high. Later the specifications of the dust were standardised at 2·5 per cent. nicotine as nicotine sulphate, 0·3 per cent. nicotine as tobacco powder. By that time it had been established that, provided the physical properties of the dust are suitable, the nicotine content need not be particularly high, and, therefore, for experimental purposes, this change in composition was of no importance. The physical properties of the dust varied somewhat in samples purchased at intervals during the four seasons of experimental work, but were generally good. The early samples were superior to those obtained at a later date. On account of the uniform results obtained in the first season's work, this dust was subsequently adopted as the standard for comparing the value of the various bunch treatments.

Nicotine Dust C.—This dust contained 2½ per cent. nicotine, claimed to be in the free state and was used throughout the first season's work.

Its physical properties were excellent. However, it was discarded in favour of nicotine dust B before the unimportance of a high nicotine content was appreciated.

Calcium Cyanide.—The commercial Calcid brand of this dust was employed. Its physical properties were good. Though included in the first two seasons' experiments, it failed to demonstrate any superiority over the nicotine dusts, and was discarded on account of the slight tendency to burn the fruit and a comparatively high toxicity to man.

Derris Dust A.—This dust was specified to contain 15 per cent. derris on a colloidal spreader, the derris having an ether extract of 18 per cent. and a rotenone content of 0·5 — 0·7 per cent. It was in a finely divided state, which was maintained in all samples. A high degree of "fluffiness" and excellent "floating" powers made this insecticide extremely suitable for the purpose required. Derris dust A was used in the 1934-35 and 1935-36 seasons.

Derris Dust B.—The only information supplied with this dust was to the effect that the approximate total ether extractives were 3·63 per cent. It possessed similar physical properties to derris dust A and, as the results obtained in experimental work were identical with those of the latter dust, it was used only in the 1934-35 season.

Derris Dust C.—In the 1936-37 experiments, a few bunches were treated with a dust claimed by the manufacturer to have the following active constituents: 2 per cent. tuba toxin as pulverised derris, 0·1 per cent. total pyrethrins, 39 per cent. sulphur as ground sulphur. In common with other dusts containing sulphur, this sample was markedly deficient in "floating" power.

Pyrethrum and Sulphur.—A mixture of equal parts of precipitated sulphur and commercial pyrethrum powder was used in 1933-34 and 1934-35. Although the best grade of precipitated sulphur obtainable was used, the mixture rapidly lost its finely particulate nature and became coarse and lumpy. Its physical properties were thus most unsatisfactory and it was also apt to burn the fruit in exposed situations.

Nicotine and Sulphur.—This dust, prepared by combining two parts of nicotine dust B with one part of precipitated sulphur by weight, had the same undesirable physical properties possessed by other sulphur mixtures. It was used only in the 1934-35 season.

Derris and Pyrethrum.—To obtain a mixture in which the proportion of derris to pyrethrum was approximately two to one by weight, derris dust A and commercial pulverised pyrethrum flowers were mixed at the rate of 40 lb. of the former to 3 lb. of the latter. This dust retained the very good physical properties of the two constituent dusts. It was used only in the 1935-36 season, following recommendations made in another State for the control of *Thrips imaginis* (Davidson, 1935), but proved in no way superior to the simpler nicotine dusts and was subsequently discarded.

Naphthalene and paradichlorobenzene.—A simple mixture of equal parts by weight of these two materials was used in two experiments.

Ovicide.—This is a proprietary tar oil spraying material, of which the active constituents are not less than 48 per cent. tar oils, 10 per cent. phenols, and 20 per cent. mineral oils. For the purpose of dipping bags in one experiment, a dip containing four parts per hundred parts of water was prepared.

Ostico.—A commercial sticky banding material for trees was used to band the bunch stalk in sundry small experiments.

Nicotine Sulphate Dip.—For an experiment on the dipping of planting material, a commercial nicotine sulphate, guaranteed to contain not less than 40 per cent. nicotine, was used at a strength of one part of nicotine sulphate to 500 parts of water with soft soap added, equal to twice the weight of the nicotine sulphate.

Paper Bags.—Large brown paper bags, previously treated with a proprietary preparation, which seemed to be linseed oil and paraffin, were supplied by a commercial firm for a small scale experiment.

(*e*) *Methods of Treatment.—Bagging.*—The bag was slipped over the bunch and the mouth tied round the bunch stalk above the top hand with a piece of string (Plate 136; fig. 1). The stage of bunch development at which the bag was fixed in position was, of course, determined by the particular treatment concerned. In all of the bagging treatments, unless otherwise stated, the bag was fitted as soon as it could be conveniently placed in position. In a normal growing season, the emerging bunch thrown by plants of average vigour is slightly beyond the horizontal position before the bags can be attached. The bracts are then "lifting," but if the bunch is at all choked, the bracts will start to "lift" before the horizontal position is reached. Under these conditions, bagging was perforce deferred for a short time until the bunch was more accessible. In some cases it was found necessary to remove one or two leaves to facilitate the operation.

In practice the experimental plots were visited at approximately weekly intervals and all the available bunches within the prescribed area of the experiment were utilized. This ensured that bunches selected on any one day would have been too immature for use in the previous week. On the first selection day there would, of course, be no such guide and personal judgment was then necessary. However, with a little experience there is no difficulty in gauging fairly accurately the age of a young bunch. The time deviation from the optimum stage of bunch development for bagging probably never exceeded four or five days, which was far less than would occur under plantation conditions.

Unless otherwise stated, bags were removed a week or a fortnight after first being placed in position, depending on the rate of growth, fallen bracts were emptied out of the bottom of the bag, bracts still adhering to the bunches were removed, the flower buds broken off and the bag then replaced in position. Occasionally slowly developing bunches were not properly opened in a fortnight and the removal of bracts and bud had to be deferred. The removal of bracts and buds acts as a safeguard against fungus infection of the fruit and assists in the preservation of the bags, which rot rapidly if a mass of decaying material is permitted to remain inside.

Cloaking.—The cloaks were wrapped round the bunches and secured at the top in the same manner as bags (Plate 136; fig. 2). They were arranged so that the overlapping sides of the cloak were at the "back" of the bunch, i.e., next to the pseudostem. The bottom of the bunch was, of course, exposed.

The amount of uncovered fruit at the back of the bunch depended on the relative sizes of bunch and cloak but, except in the case of very small bunches, at least some of the lower hands were exposed, even with the larger cloaks.

As with bagged bunches, adhering bracts were removed when loose and, to ensure uniformity of treatment, the flower buds were broken off a week or a fortnight after selection of the bunch. It was unnecessary to remove the cloaks to perform these operations.

Dusting.—Where necessary, bunches were dusted with small hand dusters (Rega Bonza models). These dusters are of the plunger pump type and hold about half a pound of dust. Separate dusters were used for each type of dust, and, owing to their small size, it was possible to carry four of them together without undue inconvenience, when a number of dusts were being used on the same experimental plot.

To cut down the dust flow to the required proportions, the cross-sectional area of the outlet from the hopper, normally about one-ninth of a square inch, was reduced to at least one-sixth of that size by the insertion of a small cork with a V groove cut in it. The hopper was never filled completely and the plunger was always operated with a steady, even stroke. These precautions overcame the tendency in this type of duster to emit dust in far greater quantities than necessary for dusting banana bunches.

In experiments where the greater part of the pseudostem was dusted, a full-sized knapsack duster of the bellows type was used. As with hand dusters, it was necessary to reduce the size of the outlet aperture and an extra length of hose was used to increase the length of the feed arm to about twice that of the standard equipment.

In treating fully opened bunches the dust was blown into the bunch from all sides to ensure adequate penetration between the individual fruits. Particular attention was given to the top hands, especially in choked bunches. With half open bunches, bracts which were too green for removal aided considerably in retaining the dust between the fingers. When the bunches were in a very early stage of development the end of the feed arm could be inserted beneath the two bracts subtending the bunch and perhaps the bract covering the top hand. In all cases the bunch stalk immediately above the top hand was dusted in the first two or three treatments.

In dusting the pseudostem, the dust was directed downwards into each leaf axil. No attempt was made to treat the pseudostem below the base of the bottom-most leaves. In such experiments the bunches were dusted in the ordinary way while rather more attention was given to the treatment of the bunch stalk than in the bunch dusting alone.

The essence of good bunch dusting lies in securing adequate dust penetration into all parts of the bunch without the accumulation of heavy dust deposits. This was reasonably simple when dusts with good physical properties were used in the modified dusters. Nevertheless, some care was always necessary to avoid excessive deposits.

Flower buds were broken off and persistent bracts removed from dusted bunches at the appropriate time, just as in the case of bagged bunches.

Bagging and Dusting.—Bags were attached in the ordinary way. Dust was applied through a small slit about three inches long in the bottom of the bags. Care was taken to ensure that the dust was directed upwards and that the opening of the feed arm did not abut against fruit or the side of the bag, while the feed arm was moved in a circular path inside the bag to give as good a distribution as possible. The amount of dust used on each bunch was determined by experience. With the dusters adjusted in the manner described, six to eight puffs (depending on the size of the bunch), delivered with a full stroke of the plunger, were adequate. More care was necessary to avoid the accumulation of dust residues than in unbagged bunches, owing to the protection against normal weathering. Flower buds and bracts were removed as with bagged bunches.

A variation of this type of treatment was introduced in the 1936-37 experiments. Second quality hessian bags were fixed on bunches in the ordinary way and were dusted three times at weekly intervals. About two hours after the third dusting the bags were removed, dipped until thoroughly wetted in Ovicide, allowed to drain for an hour and then replaced on the bunches. No further dust treatment was given.

Cloaking and Dusting.—Cloaks were placed in position and the dust applied from the bottom and back of the bunch. More dust was required than with bagged bunches owing to wind drift. On the other hand, the accumulation of dust residues could be guarded against more easily. Flower buds and bracts were removed as in the other methods of treatment.

Bunch Stalk Banding.—On several occasions, in an endeavour to assess the importance of migration by flight in populating bunches, bands of Ostico about 3 inches wide were placed round the bunch stalk above the top hand as soon as possible after bunch emergence. In addition the bunches were dusted frequently for several weeks in an attempt to eliminate the initial population acquired before the application of the adhesive band.

Repellent Bags.—The naphthalene-paradichlorobenzene mixture was wrapped in small pieces of cheese-cloth—about 2 oz. of the mixture in each piece—which were then suspended by string within the bunch, the usual position being against the stalk and between the second and third hands.

Control Bunches.—In the case of control bunches, bracts were removed as soon as they had become detached from the bunch stalk. Flower buds were broken off as soon as the bunches were fully opened. In these respects, control and treated bunches received identical attention.

Sucker Dipping.—Suckers used in the experiment to determine the possibility of freeing planting material from thrips were pared and trimmed after the manner in general use amongst banana growers, though rather less severely. Those to be treated were placed in hessian bags, which had been thoroughly wetted beforehand, and then completely immersed for five minutes in a nicotine sulphate bath. They were retained in these bags until received at the glasshouses where they were planted.

(*f*) *Assessment of Results.*—The evaluation of rust incidence in experiments involving bunch treatment has proved a difficulty to all previous investigators. Smith (1934) made the first attempt to put the matter on a satisfactory basis, by setting up a series of arbitrary values for the measurement of rust incidence on the bunch. His system was followed, with slight modification, by Weddell (1933) and during the present investigation.

Smith's scheme involved the allocation of the numerical values 1, 2, 3, and 4 to varying degrees of rust incidence. Rust development was considered in an absolute sense; that is to say, a bunch entirely free from rust

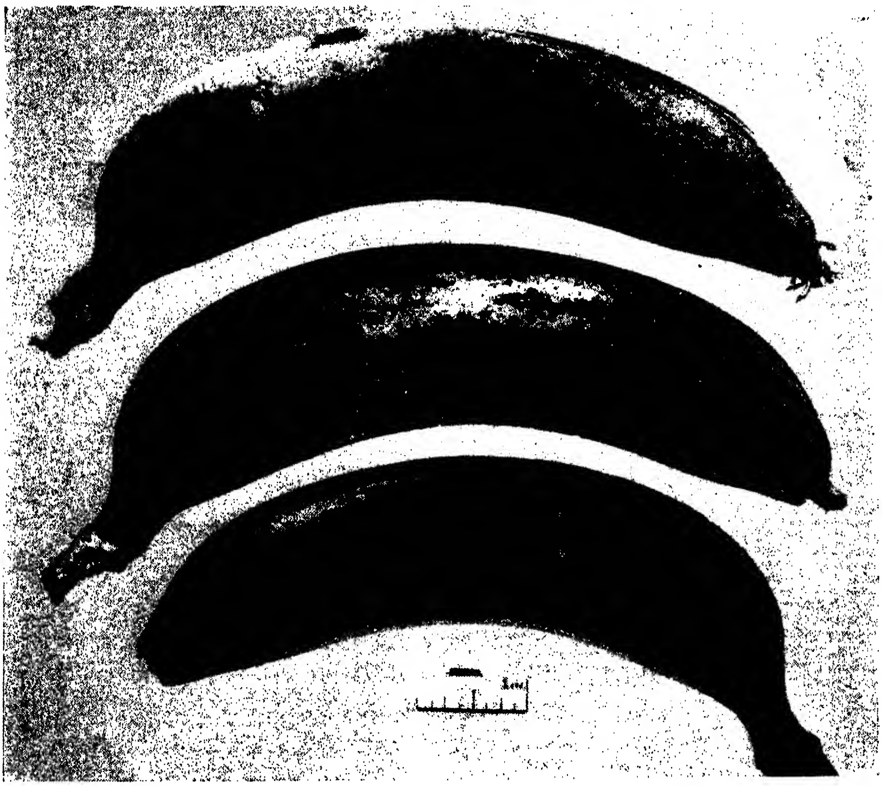

Plate 135.
Injury caused by the Banana Rust Thrips.

was allotted the value 0. Bunches falling into the category designated by the numeral 1 were commercially clean. The value 4 indicated bunches on which little or no fruit of good quality could be found.

Weddell modified Smith's system in that he allocated the value 0 to bunches which were commercially clean. The maximum value was thus 3. In addition, he introduced intermediate grades represented by the values ½, 1½, and 2½.

In the latest investigations Weddell's modified scheme was followed, rust being evaluated from the point of view of commercial, not absolute,

development. In an endeavour to clarify the position as much as possible and to eliminate the personal element in assessing the value of a bunch, a series of definitions was laid down, thus:—

Rust (Plate 135) may be—

In colour	Smoky. Red.
In intensity of colour	Slight. Moderate. Severe.
In extent on individual fruits	Restricted—to a small area round the point of contact. Fairly restricted—a somewhat larger area. Fairly extensive—up to half way along the fruit. Extensive—beyond half way.
In extent on bunch	Restricted—to certain hands. General. Irregular and sparse. Irregular and plentiful.

Similarly, cracking may be—

In intensity	Slight. Moderate. Severe.
In extent on fruit	Restricted—to contact surfaces. Extensive—over more or less all the rusted area.
In extent on bunch	Restricted—to certain hands. General.

Discolouration of sufficient extent and intensity to adversely affect the market value of the fruit is known as commercial rust.

The actual line of demarcation between commercial and non-commercial rust is difficult to draw, as the market's reaction to rust-blemished fruit varies considerably from season to season. For experimental purposes it was eventually decided that commercial rust presumes:—

(1) Smokiness which is at least moderate and extensive or severe and fairly extensive;

(2) Redness which is at least moderate and fairly extensive, or, severe and fairly restricted.

On mature bunches, smokiness is normally much less important than redness and seldom requires consideration in the evaluation of rust incidence.

The value to be allotted to a bunch was then determined, partly by the severity of the rust blemishes on individual fruits and partly

by their extent on the bunch as a whole. To aid in this evaluation, the following table was drawn up:—

Rust Categories (Fruits).	Range of Values. (Bunches.)
A. 1. Perfectly clean.	
2. Smokiness—severe and fairly restricted; moderate and fairly extensive.	
3. Redness—slight or moderate and fairly restricted; severe and restricted without cracking	0
B. 1. Smokiness—moderate or severe and extensive.	
2. Redness—slight and extensive; moderate and fairly extensive; severe and fairly restricted with slight cracking; severe and restricted with severe cracking	$\frac{1}{2}-1$
C. 1. Redness—moderate and extensive; severe and fairly extensive without cracking; severe and fairly restricted with severe cracking	$\frac{1}{2}-2$
D. 1. Redness severe and extensive with cracking ..	$\frac{1}{2}-3$
E. 1. Redness severe and extensive with cracking and splitting	$\frac{1}{2}-3$

Only the conditions representing the worst rust permissible in each category are mentioned. Intermediate types of blemish may be readily placed in their correct position. For instance, "smokiness severe and fairly extensive" obviously goes into category B.1.

Perfectly clean bunches were rarely found in the plantation during the experimental period, with the exception of an occasional treated bunch. Cracking and splitting are associated only with severe redness and provision for them is necessary only in the acute rust categories.

In assessing the value of a bunch only commercially rusted fruits were considered. It was further decided that only three or four such fruits were insufficient to justify an integral value being assigned to a bunch. This was necessary to exclude the effect of a few abnormally placed fruits which may not be typical of the whole bunch. Such blemished fruits are often found in an aborted hand at the top of the bunch and seldom have any commercial importance.

Four years' experience has shown that this system of rust evaluation is reasonably satisfactory. As all the assessments were made by the same observer, the results in all four seasons can be regarded as mutually comparable, though not sufficiently accurate for statistical analysis. At times an increased range of integral values to be allotted to bunches would have proved useful, especially in dealing with fruit showing only a small amount of commercial rust. However, an increase in the number of rust categories would not assist a visual estimation of

the extent of rust blemishes on the bunch and would be of value only if each individual fruit were examined and placed in a rust category, the value of the bunch being determined by the number of fruits in each category. This would necessitate the dissection of each fruit from the bunch and was obviously impracticable under the experimental conditions. As only large differences possess any significance from the point of view of practical control, the system adopted adequately demonstrated any worthwhile results. Actually the improvements in the appearance of bunches subject to some of the better treatments in this series of experiments was most striking.

The table of rust categories and values makes no provision for the normal variation of rust type within the one bunch. However, in practice this variation was not sufficient to prevent the more or less accurate evaluation of rust incidence on the average type of bunch.

The amount of fruit discarded on account of rust blemishes cannot be deduced from rust values allotted under this scheme. Bunches given a value of ½ may have on them a few fruits which are unmarketable, but many growers would pack all fruit on many bunches given a value as high as 1½. All growers would discard split and severely cracked fruit, but with other classes of rust there would be a great variation in the percentage waste, depending on the person packing. However, as a general rule, there would be some unmarketable fruit on bunches of value 1 with the amount of waste increasing to perhaps 50 per cent. on bunches value at 2½. No bunches to which the value 3 could be allotted were encountered during the experimental work.

Data collected in this manner will agree substantially with that based on Weddell's system. The elaboration presented represents an attempt to eliminate the personal element as far as possible in assessing the values allotted to bunches.

In practice rust values were assessed shortly before the fruit matured, as the plantations could seldom be visited on the day when the experimental bunches were being cut. As the age and rate of development of the experimental bunches was known, most of the bunch values were assessed approximately within a week before the probable date of harvesting. If the bunch was still hanging at a later visit, a further valuation was made. Some bunches were thus valued as many as four times when harvesting was delayed by adverse seasonal conditions or by faulty plantation management. This repetition afforded rather a good check on the observer, especially late in the season when rust development was practically at a standstill.

One of the experimental plots in the 1933-34 season could only be visited at three-weekly intervals, treatment in the meanwhile being carried out by other officers. Thus the interval between the valuation and harvesting of some bunches in this experiment was rather long. No allowance is made for this in the results shown, but in subsequent seasons the plots were so distributed that more frequent visits were always practicable.

(3) Details of Experimental Plots and Results.

(*a*) *Main Experimental Series.*—Treatments, location, and results from the main experimental plots are summarised in Tables I., II., III., and IV.

TABLE I.
DETAILS OF EXPERIMENTAL PLOTS.

Location.	Period of Selection of Experimental Bunches.	Period of Treatment of Experimental Bunches.	Total Period of Observation.
1933–34.			
Plot No. 1—Beenleigh	26–10–33 to 22–2–34	26–10–33 to 20–6–34	26–10–33 to 28–7–34
Plot No. 2—Cootharaba	1–11–33 to 27–3–34	1–11–33 to 27–6–34	1–11–33 to 29–8–34
Plot No. 3—Kin Kin	30–1–34 to 20–3–34	30–1–34 to 27–6–34	30–1–34 to 27–9–34
Plot No. 4—Calico Creek	26–2–34 to 10–4–34	26–2–34 to 26–6–34	26–2–34 to 26–9–34
1934–35.			
Plot No. 1—Cootharaba	9–1–35 to 3–4–35	9–1–35 to 25–6–35	9–1–35 to 16–8–35
Plot No. 2—Kin Kin	10–1–35 to 20–3–35	10–1–35 to 26–6–35	10–1–35 to 16–8–35
Plot No. 3—Calico Creek	15–1–35 to 26–3–35	15–1–35 to 24–6–35	15–1–35 to 15–8–35
Plot No. 4—Cootharaba	31–1–35 to 28–2–35	31–1–35 to 25–6–35	31–1–35 to 16–7–35
1935–36.			
Plot No. 1—Wahpunga	29–1–36 to 24–3–36	29–1–36 to 26–5–36	29–1–36 to 3–9–36
Plot No. 2—Cedar Pocket	12–2–36 to 23–3–36	12–2–36 to 25–5–36	12–2–36 to 3–9–36
Plot No. 3—Cootharaba	19–2–36 to 22–3–36	19–2–36 to 26–5–36	19–2–36 to 4–9–36
1936–37.			
Plot No. 1—Cedar Pocket	26–1–37 to 9–3–37	26–1–37 to 4–5–37	26–1–37 to 23–6–37

TABLE II.

TREATMENTS.

B	Bag, first quality.
C	Control, untreated.
D	Nicotine dust A, weekly.
D_2	Nicotine dust A, fortnightly.
E	Bag, first quality, plus nicotine dust A, weekly.
E_2	Bag, first quality, plus nicotine dust A, fortnightly.
F	Nicotine dust B, weekly.
F_2	Nicotine dust B, fortnightly.
G	Bag, first quality, plus nicotine dust B, weekly.
G_2	Bag, first quality, plus nicotine dust B, fortnightly.
G_3	Bag, first quality, plus nicotine dust B, weekly for three weeks.
H	Nicotine dust C, weekly.
I	Calcium cyanide, weekly.
J	Bag, first quality, plus calcium cyanide, weekly.
J_2	Bag, first quality, plus calcium cyanide, fortnightly.
K	Pyrethrum and sulphur, weekly.
L	Bag, first quality, plus pyrethrum and sulphur, weekly.
M	Derris, weekly.
M_2	Derris, fortnightly.
N_2	Bag, first quality, plus derris, fortnightly.
O_2	Nicotine dust B and sulphur, fortnightly.
P	Cloak.
Q_2	Cloak, plus nicotine dust B, fortnightly.
Q_3	Cloak, plus nicotine dust B, weekly for three weeks.
R_2	Derris and pyrethrum, fortnightly.
V_2	Bag, second quality, plus nicotine dust B, fortnightly.
V_3	Bag, second quality, plus nicotine dust B, weekly for three weeks.

TABLE III.

TYPE TABLE (PLOT NO. 4, 1934–35):—SHOWING THE METHOD BY WHICH RESULTS HAVE BEEN CALCULATED FOR USE IN TABLE IV.

Treatment.	Number of Bunches Assigned to Each Value.							Total Rust Incidence.	Number of Bunches.	Average Rust per Bunch.	Ratio of Rust Incidence (Control = 100).
	0	½	1	1½	2	2½	3				
B	4	16	4	..	..	..	..	12.0	24	0.50	30
F	22	3	..	..	..	..	..	1.5	25	0.06	4
F_2	9	16	..	..	..	..	..	8.0	25	0.32	19
G_2	20	3	..	..	..	..	..	1.5	23	0.07	4
M_2	8	17	..	..	..	..	..	8.5	25	0.34	21
C	..	1	8	17	16	4	..	76.0	46	1.65	100

This table shows the manner in which the results for each experimental plot were set out for close examination of rust value distribution and total incidence.

TABLE IV.

Treatments.	B.	D.	D_2.	E.	E_2.	F.	F_2.	G.	G_2.	G_3.	H.	I.	J.	J_2.
1933–34.														
Plot No. 1—														
Number of bunches	30	30	..	..	..	30	..	30	..	..	..	..	..	..
Average rust per bunch	0·03	0·12	..	..	..	0·05	..	0·03	..	..	..	..	..	..
Ratio of rust incidence	8	29	..	..	..	13	..	8	..	..	..	..	..	..
Per cent. commercially clean bunches	93	77	..	..	..	90	..	93	..	..	..	..	..	..
Plot No. 2—														
Number of bunches	23	27	..	29	17	30	..	..	..	..	29	..	..	..
Average rust per bunch	0·07	0·17	..	0	0·03	0	..	..	..	..	0·03	..	..	..
Ratio of rust incidence	10	23	..	0	..	0	..	..	..	..	4	..	..	..
Per cent. commercially clean bunches	86	67	..	100	94	100	..	..	..	..	93	..	..	..
Plot No. 3—														
Number of bunches	18	17	..	..	..	17	14	..	15	..	..	13	15	..
Average rust per bunch	0·17	0·15	..	..	..	0·03	0·18	..	0	..	..	0·23	0	..
Ratio of rust incidence	13	11	..	..	..	2	..	..	..	..	..	18	0	..
Per cent. commercially clean bunches	67	71	..	..	..	94	64	..	100	..	..	54	100	..
Plot No. 4—														
Number of bunches	18	20	20	..	..	..	..	..	..	..	20	..	..	..
Average rust per bunch	0·03	0·05	0·15	..	..	..	..	..	..	..	0·02	..	..	..
Ratio of rust incidence	10	6	..	..	..	..	..	..	..	..	2	..	..	..
Per cent. commercially clean bunches	83	90	70	..	..	..	..	..	..	..	95	..	..	..
1934–35.														
Plot No. 1—														
Number of bunches	19	..	..	..	..	19	19	..	20	..	..	..	..	19
Average rust per bunch	0·18	..	..	..	..	0	0·16	..	0	..	..	..	..	0
Ratio of rust incidence	27	..	..	..	..	0	24	..	0	..	..	..	..	0
Per cent. commercially clean bunches	63	..	..	..	..	100	68	..	100	..	..	..	..	100
Plot No. 2—														
Number of bunches	14	..	..	..	..	28	28	..	..	..	..	..	..	..
Average rust per bunch	0·04	..	..	..	..	0	0·09	..	..	..	..	..	..	..
Ratio of rust incidence	4	..	..	..	..	0	10	..	..	..	..	..	..	..
Per cent. commercially clean bunches	93	..	..	..	..	100	82	..	..	..	..	..	..	..

TABLE IV.—*continued.*

Treatments.	K.	L.	M.	M_2.	N_2.	O_2.	P.	Q_2.	Q_3.	R_2.	V_2.	V_3.	C.
1933–34.													
Plot No. 1—													
Number of bunches	28	..	..	..	..	..	..	..	..	..	..	..	58
Average rust per bunch	0·34	..	..	..	..	..	..	..	..	..	..	..	0·40
Ratio of rust incidence	86	..	..	..	..	..	..	..	..	..	..	..	100
Per cent. commercially clean bunches	46	..	..	..	..	..	..	..	..	..	..	..	43
Plot No. 2—													
Number of bunches	..	..	..	..	..	..	..	..	..	..	..	..	52
Average rust per bunch	..	..	..	..	..	..	..	..	..	..	..	..	0.73
Ratio of rust incidence	..	..	..	..	..	..	..	..	..	..	..	..	100
Per cent. commercially clean bunches	..	..	..	..	..	..	..	..	..	..	..	..	10
Plot No. 3—													
Number of bunches	..	..	..	..	..	..	..	..	..	..	..	..	32
Average rust per bunch	..	..	..	..	..	..	..	..	..	..	..	..	1·31
Ratio of rust incidence	..	..	..	..	..	..	..	..	..	..	..	..	100
Per cent. commercially clean bunches	..	..	..	..	..	..	..	..	..	..	..	..	0
Plot No. 4—													
Number of bunches	18	18	..	..	..	..	..	..	..	..	..	..	36
Average rust per bunch	0·42	0·06	..	..	..	..	..	..	..	..	..	..	0·83
Ratio of rust incidence	50	7	..	..	..	..	..	..	..	..	..	..	100
Per cent. commercially clean bunches	17	89	..	..	..	..	..	..	..	..	..	..	3
1934–35.													
Plot No. 1—													
Number of bunches	..	..	..	..	20	..	..	..	..	..	..	..	39
Average rust per bunch	..	..	..	..	0·02	..	..	..	..	..	..	..	0·66
Ratio of rust incidence	..	..	..	..	3	..	..	..	..	..	..	..	100
Per cent. commercially clean bunches	..	..	..	..	95	..	..	..	..	..	..	..	5
Plot No. 2—													
Number of bunches	27	..	28	27	..	28	..	..	..	..	..	..	54
Average rust per bunch	0·11	..	0	0·04	..	0·19	..	..	..	..	..	..	0·88
Ratio of rust incidence	12	..	0	4	..	22	..	..	..	..	..	..	100
Per cent. commercially clean bunches	78	..	100	93	..	61	..	..	..	..	..	..	0

TABLE IV—*continued.*

Treatments.	B.	D.	D_2.	E.	E_2.	F.	F_2.	G.	G_2.	G_3.	H.	I.	J.	J_2.
1934–35—continued.														
Plot No. 3—														
Number of bunches	23	..	..	..	..	24	..	..	..	..	..	..	..	..
Average rust per bunch	0	..	..	..	..	0	..	..	..	..	..	..	..	..
Ratio of rust incidence	0	..	..	..	..	0	..	..	..	..	..	..	..	..
Per cent. commercially clean bunches	100	..	..	..	..	100	..	..	..	..	..	..	..	..
Plot No. 4—														
Number of bunches	24	..	..	..	..	25	25	..	23	..	..	..	..	..
Average rust per bunch	0·50	..	..	..	..	0·06	0·32	..	0·07	..	..	..	..	..
Ratio of rust incidence	30	..	..	..	..	4	19	..	4	..	..	..	..	..
Per cent. commercially clean bunches	17	..	..	..	..	88	36	..	87	..	..	..	..	..
1935–36.														
Plot No. 1—														
Number of bunches	..	..	..	..	..	..	20	..	21	..	..	..	..	..
Average rust per bunch	..	..	..	..	..	..	0·25	..	0·05	..	..	..	..	..
Ratio of rust incidence	..	..	..	..	..	..	23	..	4	..	..	..	..	..
Per cent. commercially clean bunches	..	..	..	..	..	..	55	..	90	..	..	..	..	..
Plot. No. 2—														
Number of bunches	20	..	..	..	..	20	21	..	..	..	..	..	..	..
Average rust per bunch	0·22	..	..	..	..	0·12	0·26	..	..	..	..	..	..	..
Ratio of rust incidence	24	..	..	..	..	13	28	..	..	..	..	..	..	..
Per cent. commercially clean bunches	55	..	..	..	..	75	52	..	..	..	..	..	..	..
Plot No. 3—														
Number of bunches	10	..	..	..	..	22	22	..	..	..	..	..	..	..
Average rust per bunch	0·40	..	..	..	..	0·25	0·18	..	..	..	..	..	..	..
Ratio of rust incidence	43	..	..	..	..	27	19	..	..	..	..	..	..	..
Per cent. commercially clean bunches	40	..	..	..	..	50	68	..	..	..	..	..	..	..
1936–37.														
Plot No. 1—														
Number of bunches	..	..	..	..	..	..	..	..	22	22	..	..	..	..
Average rust per bunch	..	..	..	..	..	..	..	..	0·11	0·09	..	..	..	..
Ratio of rust incidence	..	..	..	..	..	..	..	..	10	8	..	..	..	..
Per cent. commercially clean bunches	..	..	..	..	..	..	..	..	77	82	..	..	..	..

TABLE IV.—*continued.*

Treatments.	K.	L.	M.	M_2.	N_2.	O_2.	P.	Q_2.	Q_3.	R_2.	V_2.	V_3.	C.
1934–35—*continued.*													
Plot No. 3—													
Number of bunches	..	..	25	24	..	..	23	24	..	..	..	..	48
Average rust per bunch	..	..	0·04	0·04	..	..	0·02	0	..	..	..	..	0·52
Ratio of rust incidence	..	..	8	8	..	..	4	0	..	..	..	..	100
Per cent. commercially clean bunches	..	..	92	92	..	..	96	100	..	..	..	..	10
Plot No. 4—													
Number of bunches	..	..	..	25	..	..	..	..	..	..	..	..	46
Average rust per bunch	..	..	..	0·34	..	..	..	..	..	..	..	..	1·65
Ratio of rust incidence	..	..	..	21	..	..	..	..	..	..	..	..	100
Per cent. commercially clean bunches	..	..	..	32	..	..	..	..	..	..	..	..	0
1935–36.													
Plot No. 1—													
Number of bunches	..	..	..	21	..	..	..	22	..	22	..	..	42
Average rust per bunch	..	..	..	0·28	..	..	..	0·11	..	0·39	..	..	1·09
Ratio of rust incidence	..	..	..	26	..	..	..	10	..	36	..	..	100
Per cent. commercially clean bunches	..	..	..	43	..	..	..	77	..	23	..	..	2
Plot No. 2—													
Number of bunches	..	..	..	21	..	..	21	21	..	..	..	..	41
Average rust per bunch	..	..	..	0·36	..	..	0·40	0·14	..	..	..	..	0·93
Ratio of rust incidence	..	..	..	39	..	..	43	15	..	..	..	..	100
Per cent. commercially clean bunches	..	..	..	38	..	..	24	71	..	..	..	..	2
Plot No. 3—													
Number of bunches	..	..	20	22	..	..	..	..	..	22	..	..	43
Average rust per bunch	..	..	0·30	0·27	..	..	..	..	..	0·29	..	..	0·93
Ratio of rust incidence	..	..	32	29	..	..	..	..	..	31	..	..	100
Per cent. commercially clean bunches	..	..	45	45	..	..	..	..	..	41	..	..	7
1936–37.													
Plot No. 1—													
Number of bunches	..	..	..	..	..	..	..	..	22	..	22	21	40
Average rust per bunch	..	..	..	..	..	..	..	..	0·57	..	0·16	0·29	1·05
Ratio of rust incidence	..	..	..	..	..	..	..	..	54	..	15	28	100
Per cent. commercially clean bunches	..	..	..	..	..	..	..	..	32	..	68	59	0

Some bunches of the first day's selection on Plot No. 4, 1934-35, were up to a week older than usual, a fact which may have influenced, to some extent, the ultimate rust development on treated bunches. This deviation from the usual practice was due to the late date of initiating the experiment and to the probable scarcity of newly-thrown bunches later in the season.

(*b*) *Subsidiary Experiments.*—(i.) In the first three seasons' experimental work, a number of bunches were dusted at either weekly or fortnightly intervals with nicotine dust B, the treatment being discontinued after varying periods. In practice, the bunches selected on any one day in these series were distributed equally amongst the time-treatment groups. In assessing the results, these bunches were compared with appropriate bunches in the main experimental series, viz., F and C bunches selected on the same days.

In the 1933-34 season, bunches selected on plots Nos. 2 and 3 between 1st November, 1933, and 14th March, 1934, were dusted at approximately weekly intervals for periods of 4, 6, 8, 10, or 12 weeks. Weather conditions prevented the strict adherence to a schedule involving either weekly dusting or an interval of a fortnight between treatment periods. In all cases rust development on the treated bunches was less than on the corresponding controls, but greater than on the bunches which had been treated at weekly intervals for the whole period of development (F bunches of the main experimental series). Nevertheless, under the seasonal conditions obtaining at the time, eight treatments at weekly intervals gave a reasonable degree of rust control.

In the 1934-35 season, bunches selected on plot No. 2 between 17th January and 21st February were dusted at weekly intervals for 6, 8, or 10 weeks. Ten treatments gave excellent control of rust, eight a degree of control comparable with that given by fortnightly treatments throughout the life of the bunch (F_2 bunches of the main experimental series), while six dustings effected a considerable improvement in the appearance of the bunches without giving commercial control.

In 1935-36, bunches selected on plot No. 1 on 4th and 11th February were dusted at either weekly or fortnightly intervals for eight weeks. The weekly treatment for eight weeks again gave results comparable with fortnightly dusting throughout the life of the bunch (F_2 bunches of the main experimental series), but fortnightly treatment for the limited period effected only about a 30 per cent. improvement on the untreated bunches.

Rust development on bunches in this set of experiments was checked after the cessation of treatment by observations on a series of untreated bunches selected up to the end of April in 1935 on Plot No. 2 and the end of May in 1936 on Plots Nos. 1 and 2. In the former season commercial rust did not develop on bunches thrown after the middle of April, in the latter season after the end of April. Some of the bunches in the above experiment were treated up to mid-April and, in the first two seasons, until after the end of April. The average results obtained from treatment for limited periods throughout the whole season were thus much more favourable than would normally be the case if the experiment had been restricted to bunches thrown earlier in the season.

Observations on bunches in Plot No. 2 during 1935-36, which had been maintained commercially clean for twelve weeks by weekly applications of nicotine dust B, showed that rust may develop on semi-mature

to mature bunches. Owing to dry seasonal conditions, the rate of fruit maturation was slow, and, in the ensuing four to eight weeks, measurable amounts of commercial rust developed on practically every bunch in the series.

(ii.) In 1935-36 on Plot No. 2 and again in 1936-37 a few bunches were treated with Ostico stalk bands in addition to frequent treatments with nicotine dust B for four and three weeks respectively. In both instances, commercial rust developed subsequent to the cessation of the dusting treatment.

(iii.) In 1937, derris dust C was applied at fortnightly intervals to a series of bunches selected on 23rd March. Little rust appeared on the fruit, but, owing to the late selection date of these bunches, no significance can be attached to the results.

(iv.) On the 1936-37 experimental plot, bags of second quality hessian were dipped in Ovicide after the bunches had been dusted three times at weekly intervals. The control of rust was no better than on bunches merely covered with the same quality bags and given the same number of dustings (V_3 bunches of the main experimental series).

(v.) The bags containing naphthalene and paradichlorobenzene were tried on Plots No. 1 and 2 in the 1935-36 season. The ultimate condition of the bunches in both cases was at most 25 per cent. better than the untreated control bunches. Those parts of the bunch with which the mixture came in contact showed distinct signs of burning.

(vi.) Brown paper bags were placed on a small number of bunches on Plot No. 2 in the 1935-36 season. Except where the bunch was well-shaded by the foliage of the plant and the bag was opened at the bottom, the fruit and bunch stalk were scalded so severely that the bunch did not mature. Where shade and aeration were provided, the colour of the fruit was very pale but it was not actually damaged. Moderate control of rust was obtained.

(vii.) Although the second quality hessian bag was known to be inefficient prior to these investigations, a few bunches were covered with these bags in 1936-37. Poor control of rust was demonstrated, though blemishing was appreciably less severe than on control bunches. At the same time, an increase in the area of rust on individual fruits was noted. The results suggest that the bags do not reduce the thrips population to any marked extent while creating favourable conditions for feeding at points of contact between bag and fruit.

(viii.) In the 1933-34 season, some experiments on Plot Nos. 3 and 4 involved the dusting of both pseudostem and bunch. On Plot No. 3 a ⅜-acre triangular block, consisting of approximately 210 stools planted 9 feet by 9 feet, was marked out in one corner of the plantation. The whole block was treated with nicotine dust B four times at approximately weekly intervals during February and the first week in March. On Plot No. 4, the block of bananas consisting of about 234 stools planted at the same distance apart was treated with nicotine dust B three times in four weeks during January and February. Actually four treatments at weekly intervals were scheduled, but adverse weather conditions prevented strict adherence to this programme. Comparable bunches in the centre of the treated block, in the buffer rows and in the untreated portions of the plantation reasonably close

to the treated block, were selected at intervals and the effect of the treatment assessed by evaluating the rust on these bunches at maturity. On Plot No. 3, only bunches thrown subsequent to the first dusting were marked for examination of rust incidence, but on Plot No. 4 a representative sample of the bunches hanging at the time of the first treatment was also included in the material for examination. The inclusion of such bunches did not prejudice the value of the treatment as shown by the values, for rust incidence on them was much the same as that on bunches thrown after the first dust application (Table V.). Observations on bunches in the buffer rows were solely concerned with obtaining information on the rate of migration of thrips within a plantation.

TABLE V.

——	Treated.	Buffer.	Untreated.
Plot No. 3—			
No. of bunches	36	22	38
Average rust per bunch	0.36	0.45	0.99
Ratio of rust incidence	37	46	100
Per cent. commercially clean bunches ..	37	23	0
Plot No. 4—			
No. of bunches	51	29	46
Average rust per bunch	0.39	0.29	0.88
Ratio of rust indicence	44	33	100
Per cent. commercially clean bunches ..	39	55	15

(ix.) In the sucker dipping experiment conducted during the 1936-37 season, fifty-two suckers were obtained from a heavily infested plantation. All were undoubtedly thrips infested, a sample specimen yielding forty-seven adult and larval thrips in a rapid examination. They were divided into four classes, three of which comprised good suckers sorted into large, medium, and small types, and a fourth comprising poor type suckers. Each class was divided at random into two lots of equal size for treatment and control purposes. The control lots were railed to Brisbane on the day of digging, 15th December, 1936. The other lots were treated on the same day and railed to Brisbane on the following day. They were all planted on 17th December, some in pots, some in small tanks, the treated and untreated material being kept in separate isolated compartments of the glasshouse.

On 28th January, 1937, thrips in all stages were extremely numerous on the untreated plants, while small numbers, mostly larvæ, were found on an examination of six treated plants. A thorough examination was avoided at this stage owing to the risk of mutilating the recently established plants.

On 22nd April, 1937, a detailed examination was made of all plants. Of the treated plants, 48 per cent. were apparently free from thrips and the remainder carried an average insect population of about eleven per plant. The average population of the untreated plants was fourteen insects per plant. Infestation by aphis (*Pentalonia nigronervosa* Coq.) was extremely severe on the untreated plants and ants accompanying the aphis were very numerous. Some of the plants had died, possibly as a result of aphis attacks. Aphis and ant infestation of the treated plants was negligible and no plants had died.

The results of this examination were surprising. From the superficial examination made in January and also from the lesions on the leaves caused by thrips feeding, it was quite obvious that the population of insects on both treated and untreated plants had, at some previous time, been much greater than as observed on 22nd April. The reason for this decrease was not clear as there had been no comparable population diminution in the field at this time. However, the discovery of thrips on plants grown under protected conditions in the glasshouse from suckers treated with nicotine sulphate is sufficient proof that such treatment does not completely free planting material from the pest.

(4) Discussion of Experimental Work.

(*a*) *Bagging* (Treatment B.).—It will be noted from the table of results that bagging with the first quality bags gave excellent results for the first two years but was not so satisfactory in the two final seasons of experimentation. However, only a few bunches were allotted a value greater than ½ and none greater than 1.

The manner in which bags of this nature affect rust development is somewhat puzzling. Thrips in all stages could, if necessary, pass through even the close-meshed material of which they are fashioned, though whether they do so or not is unknown. The shade conditions produced by the bag, as shown by laboratory studies, should increase rather than retard reproduction. All the evidence of four years' observations indicates that the initial population of the bunch, acquired before the bag is placed in position, is unaffected by the covering and that the bag prevents any further infestation. Presumably the larvæ present when the bag is fitted to the bunch together with the progeny of adults enclosed within it reach maturity and either leave the bag or else fail to find suitable conditions for pupation in it and die. At all events one must infer that the bag almost completely breaks the sequence of events on which continuous infestation of the bunch during its development depends. The protection of the bunch from further colonisation by the pest after the bag is fitted may be due to the masking of the bunch attraction to the pest by a "hessian odour" together with a partial or complete mechanical exclusion of the insect by the closely woven fabric. As evidence in favour of this view it was noted that rust on mature bagged bunches was obviously never of recent origin and that many bagged bunches showing considerable rust development were quite free from thrips at maturity, even in mid-summer, a condition never encountered in untreated bunches.

The above thesis may explain the variability of the results obtained in experimental control work. The amount of rust which develops on a bagged bunch would vary with the size of the thrips population on the bunch at the time the bag is placed in position. This, in turn, hinges on the time of bagging relative to bunch eversion, the density of thrips infestation and the rate of bunch eversion.

The unsatisfactory results on Plot No. 4, 1934-35, were probably due to the very severe infestation on the plantation together with slow eversion of the bunches, for though the season was a good one, the plants were not particularly vigorous. Slight differences in the age of the bunches when the bags were first fitted did not appear to militate against the efficacy of the treatment. Similar unsatisfactory results with bags in 1935-36 were undoubtedly due to retarded bunch eversion consequent on adverse seasonal conditions, the population of the bunches

Plate 136.

Fig. 1.
Banana bunch with hessian bag attached.

Fig. 2.
Banana bunch with hessian cloak attached.

at the time of bagging being high. The 1933-34 season was a normally good one and plant growth followed its usual rapid course during the rust season.

Previous investigators had had extremely variable results with the same quality bags and it is highly probable that conditions similar to those outlined above were encountered.

The results obtained on Plot No. 4, 1935-36, where the most severe test was given, definitely turned the scales against bagging alone as a measure of rust control. Although a very considerable improvement was effected in the appearance of the majority of the treated bunches, the treatment must be regarded as a failure in the light of its cost. Bagging alone will, in southern Queensland, always affect some improvement in the rust position and, under conditions of light to moderate thrips infestation and vigorous plant growth, it will undoubtedly often give excellent commercial control. These conditions are, however, rather ill-defined and it is impossible to make recommendations on such a basis. Under some circumstances, such as severe infestation and slow growth, it is conceivable that bagging alone would be economically disastrous.

The more open mesh of the second quality bags would appear not to prevent the ingress of thrips on to the bunch. The degree of rust development under such bags is usually greater than could be attributed to the initial population when the bags are attached. Previous experience in the Gympie district and in North Queensland with these bags has been disastrous, very severe and extensive rust developing on practically all bunches concerned.

The bagging of banana bunches has many incidental advantages. The general quality of the fruit is improved very appreciably under all conditions; the fruit matures more evenly all over the bunch and also "fills out" satisfactorily in spite of cold weather; sun scald, very prevalent when the plants have been more or less defoliated by leaf diseases during the autumn and winter, is completely eliminated; cracking of the mature fruit, associated with the first cold snap in the autumn, is materially reduced; damage due to incidental pests such as fruit-eating caterpillars, grasshoppers, birds, opossums, wallabies, and flying foxes is reduced to negligible proportions. Black pit, a disease of the fruit, which was rather serious in 1933-34 on Plot No. 3, appeared to be completely controlled by the bags.

On Plot No. 1 in 1933-34, cigar end and black finger, two other fungous diseases of the fruit, were fairly prevalent but bagging did not appear to affect their incidence.

The only disadvantage of bagging is a very slight tendency to rub the ends of the fruit on bunches exposed to winds.

(*b*) *Cloaking* (Treatment P.).—Little rust developed on cloaked bunches during 1934-35, but rust incidence in the one experimental plot concerned was too slight for the test to be a rigorous one. In 1935-36, under conditions of heavier infestation, results were not so satisfactory, though, even in this case, rust incidence was not severe. As the more efficient bags proved unsatisfactory in this season, it was obvious that cloaking could never be satisfactory and no further attention was paid to this treatment.

Cloaking has a beneficial effect on the quality of the fruit, but observations were not sufficiently detailed to show if, as commonly believed, these benefits are less than those obtained by bagging.

(*c*) *Dusting* (Treatments D, D_2, F, F_2, H, I, K, M_1, M_2, O_2, R_2).—Weekly treatment with nicotine dusts throughout the life of the bunch gave uniformly good results in all experimental plots. Fortnightly treatment with the same class of dust also gave a fair degree of control, though appreciably less than the more frequent applications. In both cases, nicotine dust B showed a slight superiority over nicotine dusts A and C. Treatment at either weekly or fortnightly intervals for limited periods was shown to be unreliable because its success is dependent on other variable factors, such as the rate at which the bunch matures.

Derris dusts applied at weekly or fortnightly intervals gave results not obviously worse than the nicotine dusts. Observations on their toxicity to *S. signipennis*, however, indicated an undesirable variation from sample to sample.

Sulphur mixtures exhibited very unsatisfactory physical properties; all showed a tendency to burn the fruit on exposed bunches and none gave a degree of control as great as that achieved by nicotine dusts. Calcium cyanide also showed no superiority over nicotine dusts.

It was therefore concluded that nicotine dusts were the most satisfactory for banana rust thrips control, and that only applications at intervals of not more than a week throughout practically the whole life of the bunch could be relied upon to give good commercial control under practical plantation conditions. At the same time there was no evidence to indicate that more frequent treatments are justified. During experimental work, weather conditions at times interfered with the dusting schedule and in commercial practice the same thing would occur.

The rapid but ephemeral action of the nicotine dusts as compared with the slower but more prolonged effects of derris dusts was fully appreciated. However, frequent and heavy falls of rain, to which most banana districts are subject during the rust season, exert a marked "cleansing" effect on bunches and may largely nullify any benefits to be derived from the more lasting toxicity of derris dusts. In fact, in the event of rain very shortly after dusting, the value of the treatment might be negligible. On the other hand, the almost instantaneous effect of nicotine on the thrips must be an important factor in effecting control in showery weather. There was no evidence that the purely mechanical effect of the dust cover, investigated by Smith (1934) was of any practical service in the control of rust.

During these experiments, the importance of the physical properties of dusts for treating banana bunches became increasingly obvious. Heavy, quick-settling dusts are quite unsuitable; the material must be light and "fluffy."

The dust residue is of some importance, particularly in the weekly treatment of bunches. Theoretically, the promotion of dust residue formation is desirable (Smith, 1934) but, in practice, some care had to be exercised to avoid an excessive residue at the time of bunch harvesting. In the markets a reduced price may be paid for fruit carrying an appreciable residue. Cleaning is a laborious task and adds significantly to the cost of rust control. Dusts of poor quality, i.e., with poor physical properties, have a tendency to leave heavy residues. Dusters

wrongly adjusted or inefficiently manipulated are apt to cause trouble, while the dusting of damp bunches results in a caked residue which even torrential rain will sometimes not remove. On the other hand, the normal rains play an important part in keeping bunches reasonably clean. The correct adjustment of the dust outlet, the careful manipulation of the duster and the choice of reasonable weather for treating the bunches should, under commercial plantation conditions, obviate any dust residue problem.

(*d*) *Bagging and Dusting* (Treatments E_1, E_2, G, G_2, G_3, J, J_2, L, N_2, V_2, V_3).—The use of the better quality bags with either weekly or fortnightly treatments throughout the life of the bunch with any of the dusts used gave excellent control of rust in these experiments (Plate 137). The appearance and quality of the fruit were good, while rust blemishes were negligible. The nicotine dusts, particularly nicotine dust B, were subjected to rather more severe tests than the others and consistently gave slightly superior results. Calcium cyanide was inclined to cause burning, while heavy residues of both this dust and the pyrethrum-sulphur mixture tended to accumulate on the bunch.

Weekly dustings for three weeks with a nicotine dust under the better quality bags, tried only in the last season's experiments, gave very promising results. This method requires further testing under severe conditions. Nevertheless, the supposed action of bags as already discussed, suggests that, for practical purposes, it will be as efficacious as any other.

The use of the second quality bags combined with three dustings at weekly intervals offers little promise of a cheaper method of control, in the light of the results obtained in 1936-37 under conditions of only moderate rust incidence. Fortnightly dustings throughout the life of the bunch gave better results. However, it appears obvious now that the most important time to arrest rust development is during the first month after the bunch is thrown and thus more frequent treatments during this period seem highly desirable. As second quality bags apparently do not prevent subsequent reinfestation of the bunch, numerous treatments with a dust would be necessary. The matter then resolves itself into one of relative costs of the two methods, viz., good quality bags with the restricted number of dustings and second quality bags with frequent treatments. On this score the former is preferable.

The treatment of the second quality bags with the tar oil preparation did not materially affect the degree of control attained. It must be conceded that negative results on this occasion do not close this avenue of approach to the problem. Closer attention to the selection of possible repellents might be worthwhile. Cost and applicability to Queensland plantation conditions would be dominant points for consideration.

Dust residues have also to be considered in this method of control. With good quality dusts there was generally less residue than on bunches dusted alone despite the complete absence of cleansing effects of natural agencies. This was no doubt due to the smaller quantity of dust used per bunch and to the method of applying it. Even dusting under damp conditions did not usually cause the caking effect often seen on exposed bunches. Poor quality dusts, on the other hand, were responsible for a more acute form of the problem. Nicotine dusts, with good physical properties, showed out to best advantage in this respect, for it was found that only small quantities need to be applied.

The bag is presumed to function as a fumigation chamber, the efficiency of which depends on the quality of the hessian used. The greater efficiency of the nicotine dusts can thus be easily understood. The concentration of nicotine in the atmosphere of the bag must become fairly high and may prove lethal to thrips in the more sheltered parts of the bunch, where they escape actual contact with dust particles. Second quality bags permit rapid leakage of both dust and fumes through the fabric, especially under windy conditions. This leakage, particularly in new bags, is less obvious with the better quality article.

The beneficial effect of covering the fruit is just as marked as in the case of bagging alone and provides an additional argument in favour of bagging and dusting as compared with dusting alone.

(*e*) *Cloaking and Dusting* (Treatments P, Q_2, Q_3).—The use of cloaks and only three dustings with nicotine dust B was definitely not efficient. Fortnightly dustings throughout the life of the bunch, in addition to cloaking, gave very fair results and may provide a relatively cheap form of fair control, especially if supplies of cheap material suitable for cloaks are available. At the same time control is far below that obtained by good quality bags plus dusting. The incidental beneficial effects on fruit quality, characteristic of bagging, are perhaps less marked, but they warrant the use of this method in preference to weekly dusting alone. The dust residue problem is comparable with that arising with bagging and dusting.

(*f*) *Bunch and Pseudostem Dusting.*—The results obtained from this method of treatment were not satisfactory. Considerable rust developed during the season both before and after treatment. The quantity of dust used is considerable and the operation of dusting is extremely unpleasant. The sheltered habitat frequented by the pest species renders efficient treatment of a great part of the population virtually impossible. The method offers little prospect of economic practicability.

(*g*) *Sucker Dipping.*—The dipping of suckers treated in the manner described offers no solution to the problem of obtaining clean planting material. The advisability of dipping "bits" or heavily pared suckers is still an open question. Theoretically, "bits" are most likely to be free from thrips and in view of the increasing popularity of this type of planting material, further investigations are desirable.

(*h*) *General Remarks.*—None of the other methods of bunch treatment gave results worth further discussion.

On several occasions the control programme was interfered with by wet weather, particularly in the 1933-34 and 1934-35 seasons, the rainfall in which was more or less normal. The seasons 1935-36 and 1936-37 were abnormally dry and experimental work proceeded practically without interruption. The weekly interval between treatments was sometimes extended to a fortnight or the fortnightly intervals to three weeks on account of rain. No allowance is made for these facts in the results. In all cases the irregular attention was prejudicial to the success of the treatments, though some treatments may have been affected more than others. At the same time such interference could normally be expected under commercial conditions.

During the dusting of bunches there was naturally a dust drift across on to neighbouring plants. In some cases bunches subject to other treatments would have been in the path of such drift. Tests with

nicotine dusts applied to the open bunch showed that the thrips were affected at a distance of 10-15 feet. It is unlikely that very good penetration into the bunch would be secured by a mere drift of dust and thus only the more exposed insects would have been affected. Owing to their random distribution, bunches of all treatments, including controls, would have been affected in the same proportion.

The experimental bunches comprised only a small proportion of the bunches in the plantation and, with the exception of Plot No. 1 in 1933-34, no treatment was given to the rest of the plantation by the owners. Treated experimental bunches may therefore have been subjected to greater reinfestation than would have been the case had all bunches in the plantation been effectively treated. Bunches, however, harbour only a small proportion of the total thrips population in the plantation, and this increased reinfestation factor cannot have been of great importance.

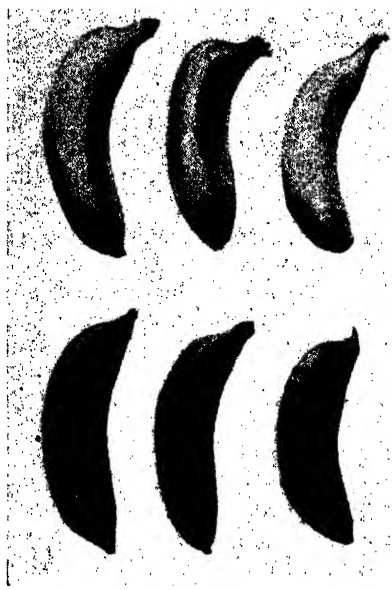

Plate 137.

Typical fruits from treated and untreated bunches. Upper row—from a bagged and dusted bunch. Lower row—from an untreated bunch cut at the same time.

The application of dusts under very windy conditions is apt to make efficient treatment difficult. In commercial practice little notice could be taken of wind, and deviations from the dusting schedule can only be justified by wet weather.

No account was taken of the probable optimum conditions during the day for the application of control measures. Temperature and humidity may have some effect on the efficiency of the nicotine and other dusts. Dusting was carried out any time between about 9 a.m. and 5 p.m. and, as all treatments were applied simultaneously, there should have been no differential effects between dusts attributable to the time factor. In commercial plantation control operations, no cognisance could be taken of optimum conditions for treatment during the day.

During these experiments it became quite clear that the first month or so after the bunch is thrown is the most important in rust control.

This can be easily understood. In the first place, the initial population of adults and their progeny is much greater than that acquired later on in bunch development. Secondly, effective measures directed against this early population prevent, to a large extent, the establishment of larval colonies which on account of their numbers undoubtedly cause more damage than adults. Thirdly, the young bunch is more susceptible to injury than more mature fruit. It is essential, therefore, that rust control measures should be applied as soon as possible after bunch throwing and that early treatments should be particularly thorough.

[TO BE CONTINUED.]

Plate 138.
On the road to Bingil Bay, North Queensland.

Cotton Jassids or Leafhoppers.

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JASSIDS were recorded as pests of cotton in Queensland some years ago, but were not considered very important, though crops growing on red scrub soils were frequently attacked. In recent years the insects have been troublesome in areas which were previously unaffected, and numerous crops on the hitherto free forest alluvial soils have been heavily infested and damaged.

Many countries have reported jassids as pests of cotton. They have been particularly destructive in parts of Africa, where they seriously restricted production prior to the introduction of jassid-resistant strains of cotton.

Cotton jassids in the Upper Burnett, Callide, and Dawson Valleys have been assigned to the genus *Empoasca*. Material collected from cotton at Biloela some years ago was described by Paoli as *Empoasca terra-reginoe*, but other unidentified species are probably implicated.

Injury.

Normally the pest does not cause noticeable damage until after the February or March rains, when the crop is nearing maturity. Even when jassids are abundant, September or October-planted cotton frequently produces a good yield, for bottom and middle crops of bolls are formed and matured before the peak of the attack. Late-planted cotton, however, may give only a very light crop, especially if the small bolls, flowers, and squares on the plant are shed following corn-ear worm attacks or dry weather.

Occasionally in a dry period, young plants may be attacked by jassids migrating from nearby dying weeds. The stunting of the seedlings caused by low soil moisture is then accentuated. The leaves wilt, the growth of the main terminal is distorted, and the seedlings may die. Good rain will reinvigorate the plants should they survive the combined effects of dry weather and jassid injury and, though a moderate jassid population may persist, the crop will recover. Any rapid increase in the pest population as the crop matures will, of course, cause further injury.

In the early stages of an attack on a maturing crop, adult and nymphal jassids are common on the under surface of the leaves. These acquire a slight yellowish or brownish marginal discoloration which is particularly noticeable in the older leaves. The leaves curl, the younger ones markedly so. In heavy infestations the leaves may brown quickly and die, but more commonly the top surface of the leaf turns red from the margin inwards, and an affected field presents a dull red appearance when seen from some distance away. Occasionally the lower leaves show a white spotting similar to that which typically follows jassid feeding on many other plants.

Attacked plants tend to shed their leaves, particularly during showery weather, when moulds appear on the injured foliage.

Shortly after the curling of the younger leaves and the first signs of discoloration in the older leaves, plant development is retarded, and almost ceases with the general reddening of the foliage. Squares,

flowers, and young bolls are shed, immature bolls develop poorly and produce wasty lint or may dry up altogether, and only mature bolls or those near maturity open up satisfactorily.

A mild outbreak may not prevent the maturing of both bottom and middle crops. Should a top crop form, however, the quality of the lint is not as good as that from uninfested plants.

The injury caused by jassids can scarcely be due simply to the removal of sap during feeding—the after-effects are too severe. Aphids, which also suck plant juices, may exist on cotton in very large numbers without causing injury comparable in severity with that due to jassids. It appears (Parnell, 1926; Peat, 1927) that jassids not only remove sap when feeding but also inject toxins which are the chief cause of injury. These toxins are secreted by both adults and nymphs, but the injury varies not only with the amount of feeding but also with the age of the insects infesting the plants, the younger insects being the more harmful.

Factors Influencing Jassid Populations and the Susceptibility of Cotton to Infestation.

Climatic Conditions.—Dry weather may cause jassid migration from weeds or crops to young cotton, which wilts less readily.

The pest is present in cotton fields shortly after the seed germinates, but normally large populations do not appear until after prolonged rains in February or March, when the crop is approaching maturity. Excessive rains accompanied by long periods of dull, showery weather during these months tend to promote sappy growth in the American varieties, which comprise the bulk of the cottons grown in Queensland. Such growth appears to be very attractive to jassids. Plants developing slowly without excess vegetative growth suffer less severely. Thus, when the crop matures in dry conditions in late summer the plants carry few jassids, but under humid conditions the plants may make sufficient new growth to attract the pest in injurious numbers.

In the absence of frosts, small numbers of both adults and nymphs may persist on cotton until midwinter, and it is therefore probable that jassids continue to breed slowly on fields of standover cotton throughout a mild winter.

Age of Plants.—During the last four seasons jassids have been noted in cotton of all ages, but normally they are most abundant in late summer, when the crop matures. Late-sown, vigorously-growing crops are particularly susceptible.

Soil Effects.—Some years ago jassid outbreaks were apparently confined to crops grown on red scrub soils, but recently the pest has also been destructive elsewhere, particularly on the rich alluvials. Cotton grown on ironbark slopes is less heavily infested. The importance of the pest in any district apparently depends on the type of plant grown, heavily foliaged vegetative crops being attacked more severely than sturdy, evenly grown, fruiting crops. As the growth habit of the plant is largely determined by soil type and cultural treatment, the recent increase in the importance of the pest and the extension of the area subject to infestation are probably associated with soil changes brought about by cultivation and cropping practices.

The sporadic incidence of jassids has been explained in various ways. Ballard (1927) suggested that potash and phosphoric acid deficiencies in red scrub soils created an unhealthy state of growth which contributed to the onset of severe jassid injury in cotton. As jassids are now serious on a number of soil types in the cotton growing areas, deficiencies peculiar to one soil type scarcely account for the present importance of the pest. In any case, increases in yields from manurial trials in Queensland have been insufficient to warrant the use of fertilizers.

Soil analyses at the Cotton Research Station, Biloela, indicate an abnormally high rate of nitrification during the early summer months in alluvial soils cropped for some years with cotton. The supply of nitrate nitrogen then exceeds the requirements of the cotton plant, more particularly in wet seasons, and bushy jassid-susceptible crops are produced. Rhodes grass rotations offset this tendency, and crops grown after pasture produce a better fruiting type of bush which carries less foliage and is less susceptible to jassid injury.

In Queensland, jassid attacks are associated with heavy rains during periods of cloudy weather, and occur on various soil types. Hence, though soil improvement methods, e.g., the use of Rhodes grass in the rotation, would undoubtedly increase the chances of a larger crop before the onset of jassids in the cotton areas, the bulk of the top crop, in late-sown areas at least, may still be lost if weather conditions are conducive to the rapid breeding of the pest.

Inadequately drained or drought-susceptible soils are said to produce plants more subject to jassid attacks, probably by lowering the resistance of the plant (Haines, 1925; Parnell, 1926; Russo, 1932; Hargreaves, 1934). Some of the jassid resistant strains of cotton are certainly less susceptible to the effect of dry weather than other strains.

Cotton Varieties.—During early investigations in India and South Africa (Worrall, 1923; Parnell, 1925) certain cotton varieties were found to be more resistant to jassid than others, and particular plants within varieties exhibited a high degree of resistance and tolerance to the pest. In spite of the frequent association of severe jassid attacks with crops grown on unsuitable soils, the selection of jassid resistant cottons was considered much more important in combating the pest than the amelioration of soil conditions.

Resistance appears to be partly due to the unsuitability of the plant for jassid breeding and partly to its ability to tolerate the pest. Small blocks of resistant strains of cotton imported from South Africa and grown in Queensland carried adults and nymphs, but did not show the pronounced symptoms of jassid injury. Under reasonable climatic conditions some of these strains grew well and gave good yields of seed cotton. Unfortunately, the size of the boll and the character of the lint compared unfavourably with the American Upland varieties grown in Queensland.

Though resistant plants are typically very hairy on the under surfaces of leaves, leaf stems, stems, and involucral bracts, all hairy plants are not necessarily resistant. Resistance apparently depends largely on the type and numerical density of the hairs. A highly resistant variety, Cambodia, an Indian cotton, has very long hairs,

and there is apparently a much closer relationship between hair length and resistance than between numerical density of the hairs and resistance.

The true relation between resistance and hairiness has not yet been satisfactorily established. The acidity of the cell sap may be involved, though the mechanical effect of the hairs is probably more important, for the hairy midribs and petioles may hinder egg laying (Parnell, 1937).

Unfortunately, short lint and hairiness appear to be linked genetically. In breeding work, a longer staple cotton may be evolved at the expense of either or both reduced yield and greater susceptibility to jassid attacks. Similarly, resistance may be increased at the expense of yield or desirable lint characters. These factors seriously complicate the breeding of suitable resistant varieties.

Life History and Habits.

Cotton jassids are tiny, active, fly-like insects which breed on cotton and feed by sucking the plant juices.

The sickle-shaped eggs are entirely embedded in the plant tissue, and are of a light greenish colour. They are laid in the midrib, larger veins, and petioles of the leaves, and in the younger growth of the stems. From the egg emerges a nymph similar in appearance to the adult, but without wings and much smaller. The nymphs are at first creamy white in colour, but later become greenish. When disturbed they hop actively or move round on the under surfaces of the leaves with a characteristic sideways movement. Feeding takes place chiefly on the under surfaces of leaves.

At each of the several stages of growth the nymph moults, i.e., casts its skin, and finally reaches the winged adult form. Numerous cast skins remain attached to the under surfaces of injured leaves.

Observations at Bowen (Atherton, 1933) between May and August showed that the incubation period of the egg of a related *Empoasca*, which breeds on tomatoes, is 10 to 14 days. The average duration of the total nymphal period for males in June was 15·8 days, and in July 19·6 days; for females the period was 13 days in June and 20·6 days in July. The development of the cotton jassid is probably similar. As with most insects, the various life history stages would be much shorter in summer and autumn, when the pest is injurious to cotton.

Control.

If cultural improvements and the use of resistant varieties of cotton will permit the production of payable crops where jassids are at present troublesome, other control methods will be unnecessary. Should control be impracticable in this way, the value of insecticides must be further investigated.

In Queensland, soil and climatic conditions frequently favour both the growth of the generally-used American Upland cottons and the rapid breeding of jassids. During the hot months of January, February, and March, cotton must have ample rain to set and mature a good crop. Without these rains the crop may be a partial failure, particularly if planting is late, and with them jassids usually become prevalent and cause extensive losses.

By Insecticides.—Preliminary trials have been made in Queensland of various insecticides for jassid control. Flowers of sulphur, nicotine dusts of 2 per cent. and 3 per cent. strength, a proprietary dust containing 1 per cent. nicotine and 5 per cent. creosote, and one containing 3·2 per cent. tubatoxins as derris and 0·13 per cent, pyrethrins as pyrethrum were used in experimental work. The dusts were applied at the rate of 15 to 20 lb. per acre, and with the exception of sulphur, all checked the pest. However, frequent applications are required to ensure control, necessitating a considerable and usually uneconomic expenditure on materials and labour. Bordeaux dusts and sprays gave negligible results in earlier work with the related species on tomatoes at Bowen. Insecticides are, therefore, not considered a solution to the control problem at the present time.

By Cultural Methods.—Proper cultural attention is unquestionably of major importance in increasing the resistance of the plant to pests and diseases. Consideration should, therefore, be given to improving present standards of cultivation. On the average of seasons, good farming practices are amply repaid by reduced losses from pests.

Early preparation of the land is essential if the crop is to be sown with the first suitable planting rains, and thus given a chance of escaping severe jassid injury in late summer.

Land cropped for many successive years with cotton seldom produces a payable crop. Yields will have dropped to unpayable levels and Rhodes grass rotational treatment is required in order to readjust the cultural properties of the soil to the needs of the cotton plant. When this is done, the risk of planting failures is reduced and the prospects of an early crop improved.

Weedy paddocks and stand-over cotton in which jassids may over-winter should either be cultivated or planted with Rhodes grass.

By Resistant Varieties.—In South Africa, the discovery that jassid resistance is associated with certain types of hairiness made possible the production of jassid-resistant and jassid-tolerant strains of cotton. Without these strains the successful establishment of the cotton industry in some areas, would have been extremely difficult, if not impossible.

The development of the jassid-resistant cotton U4 and its derivatives was made through single-plant selections, based on hair characteristics as a measure of jassid resistance. Great care was needed in the final selection of strains for distribution, owing to the frequent linkage of resistance with short staple and low yields. Selections from local cottons gave the most promising results and one of these strains, U4, is the parent plant from which many selections have since been made.

The final selections released to the industry were not so immune to jassids as some other strains and varieties, but they did possess a high degree of resistance, and were described as "tough, hardy, and capable of withstanding all vicissitudes better than the average plant" (Parnell, 1925). To still further increase its resistance, U4 has been crossed with Cambodia, a very hairy cotton, and the progeny back crossed to the U4 in an endeavour to combine the exceptionally high resistance of Cambodia with the lint qualities, free fruiting habits, earliness, and drought resistance of U4.

The American Upland varieties, in common use in Queensland, have not exhibited any marked resistance or tolerance to the pest, though crops planted early on new or Rhodes grass conditioned land may escape severe attacks. Good yielding, desirable types of plants have, however, been observed within infested fields of these varieties.

As the control of jassids in cotton by any of the available insecticides does not appear to be economically possible in the field, the pest will probably be important until resistant strains have been bred in Queensland for local use. Any such jassid-resistant cottons must possess lint characters suitable for the Australian market; must have good picking qualities; and must be able to yield well under the very variable seasonal conditions characteristic of the cotton belt. An ability to recover from a corn ear worm attack is also essential.

By Biological Means.—No information has been collected on the natural enemies of jassids in the cotton-growing areas of Queensland, but from an allied species, *Empoasca viridigrisea* Paoli., which attacks tomatoes at Bowen, two egg parasites, *Anagrus armatus* Ashm. var. *australiensis* Gir. and *Aphelinoidea howardii* Gir., have been recorded (Atherton, 1933). The occurrence of similar parasites on jassid eggs in the cotton is highly probable.

Partial control by parasitic fungi, egg parasites, and capsid predators, has been noted in other countries, but little reliance can be placed on biological control as a solution to the jassid problem in Queensland.

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Notes on the Genus Flindersia with Keys for the Determination of the Rain-forest Species.

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[Flindersia is a group of trees the name of which commemorates Matthew Flinders, the famous navigator. It is preponderantly Australian, and contains some of our most important timbers, such as Crow's Ash, Hickory Ash or Cairns Hickory, Maple Silkwood or North Queensland Maple, Yellow-wood or Yellow-wood Ash, Rose Ash, Silver Ash, and others. The following account by Mr. Francis should be of value for the identification of the different species in the field.—Ed.]

FROM the economic point of view, the genus Flindersia is a very important one. The majority of the Australian species produce timber which is or has been used commercially. Two of the best-known timbers provided by the genus Flindersia are Queensland Maple and Crow's Ash. These two timbers have conspicuous properties which have made them highly valuable in a purely commercial sense.

The latest revision of the genus Flindersia known to the writer is that by C. T. White, in "The Proceedings of the Linnean Society of New South Wales," Vol. 46, p. 324, 1921. White states that eighteen species are known, and of these only three are found outside Australia. These extra-Australian species are *Flindersia amboinensis* (Amboina), *Flindersia Fournieri* (New Caledonia), and *Flindersia papuana* (Papua). Since the publication of White's paper, a further species, *Flindersia macrocarpa*, has been described from Papua.

All of the Australian species except two are denizens of the rain forests, and they conform in all cases to the usual type of rain-forest tree.

The two species which are not rain-forest trees are *Flindersia maculosa* and *Flindersia Strezeleckiana*. These two species are found in the dry western parts of the State. *Flindersia maculosa* also occurs in similar areas of New South Wales.

Flindersia maculosa is known popularly as Leopard Tree. The bark is smooth, pale or green, and in parts there are roundish or irregular depressions often of a different colour from the surrounding bark. These depressions are apparently left by scales of shed bark. The leaves are simple and not pinnate (consisting of several leaflets) as in other species.

Flindersia Strezeleckiana is sometimes known as Spotted Tree. The bark is similar to that of *F. maculosa.* This species is distinguished from *F. maculosa* by the fact that the leaves are pinnate and generally consist of 3-5 leaflets, although these are occasionally reduced to one. The leaf rhachis (the axis to which the leaflets are attached) is generally expanded into a narrow green wing as in *Flindersia collina.*

Both *Flindersia Strezeleckiana* and *F. maculosa* appear to be allied to *Flindersia collina*. There is a marked resemblance in the appearance of the bark in the three species. The winged leaflet-axis of *F. Strezeleckiana* and the shape of its leaflets are characters which are shared by *F. collina*. In the choice of its habitat *Flindersia collina* also shows translations towards *F. maculosa* and *F. Strezeleckiana*, as it is only found in rain forest of a dry type in which the rainfall is low as at Nanango, with an annual average of 32 inches.

Normally the leaves in the genus Flindersia are placed opposite to each other on the branchlets. Occasionally they are alternate and crowded at the ends of the branchlets as sometimes happens in the Crow's Ash, *Flindersia australis*.

Keys for the approximate determination of the rain-forest species are given below. The separation of the southern or extra-tropical species is shown in a separate key. A much more rapid and more reliable method of determining these southern species is provided by the illustrations in "Australian Rain-forest Trees." All of the southern rain-forest species are depicted there by photographs of the trees in the field and of herbarium specimens.

Perhaps it should be explained that the key to the tropical species was originally constructed for the writer's own use in the rain forests of the Atherton Tableland. It is not so free of technicalities as might be desired, and the writer is also aware that the leading analytical characters are not quite free of ambiguity. However, many analytical keys employed by botanists must be used with caution and exacting literal interpretations must at times be abandoned.

A Key as a Guide to the Determination of the Rain-forest Species of Flindersia in Tropical Australia.

Leaflets very unequal-sided.

- Leaflets ovate, acuminate or prominently acuminate, venation more prominent below where there are 9-14 primary nerves sometimes with subsidiary nerves and indistinct reticulations. Capsule densely prickly, about 4 inches long .. .. *F. Pimenteliana.*

Leaflets unequal-sided (not so much as in *F. Pimenteliana*).

- Leaflets ovate, shortly acuminate, 7-10 primary nerves on each side of midrib, sometimes subsidiary nerves but rarely, if ever, are reticulate nerves visible. Capsule about 4 inches long with scar-like marks instead of prickles on back .. .. *F. Brayleyana.*
- Leaflets lanceolate or narrow and long, veinless or only indistinctly showing primary nerves, acuminate or long acuminate. Fruit almost smooth, scarcely exceeding 1 inch long .. *F. laevicarpa.*
- Leaflets lanceolate or narrow and long; primary nerves 8-13, underside showing at times numerous transverse nerves joining the primary ones, sometimes pubescent below, acuminate or long acuminate. Capsule 3·75-5 inches long, crowded with large prickles .. *F. acuminata.*
- Leaflets broadly or narrowly lanceolate or elliptical, the narrower ones curved or sickle-shaped, densely hairy on raised veins below with felted star-shaped hairs, midrib and primary nerves (15-30) alone visible above. Leaflets 4-12 inches long. Capsule 4 to over 5 inches in length, densely prickly .. .. *F. pubescens.*

Leaflets equal-sided or nearly so.

Leaflets ovate or lanceolate, primary nerves (15-36) and some reticulate veins visible, apex obtuse, acute or slightly acuminate. Fruit about 3 inches long with obtuse prickles .. .. *F. Ifflaiana.*

Leaflets narrowly elliptical or lanceolate, often long and narrow, sometimes pubescent below. Venation obscure or primary nerves (15-18) alone visible, narrowed towards the apex and sometimes slightly acuminate. Capsule 4 inches long, densely prickly .. .. .. *F. Bourjotiana.*

A Key as a Guide to the Determination of the Rain-forest Species of Flindersia in Extra-tropical Australia.

Boat-shaped valves of capsule united at base even in age.

Leaves alternate or less frequently opposite, crowded towards the ends of the branchlets. Leaflets 3-13. Midrib and primary nerves alone prominent above .. .. .. *F. australis.*

Boat-shaped valves of capsule eventually separating completely.

Leaf rachis (the axis to which the leaflets are attached) extended into a narrow green wing. Leaflets 3-7, mostly broadest at apex. Capsule 1½-2 inches long .. .. *F. collina.*

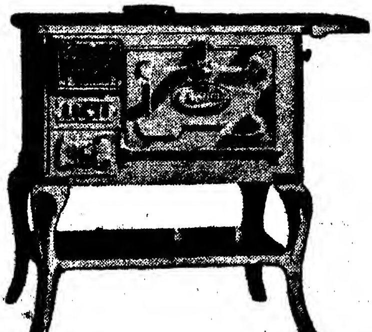
Leaf rachis never extended into a narrow wing, mostly rounded or angular.

Midrib and primary nerves (but not the net veins) visible on both leaf surfaces.

Leaflets 9-17, mostly very unequal-sided and often ear-shaped or rounded at base. 3-5 inches long on adult trees. *F. Schottiana.*

Leaflets 4-11, distinctly stalked, tapering into the stalklet and not rounded or ear-shaped on one or both sides, 2-4 inches long .. .. .. *F. Oxleyana.*

Midrib, primary nerves, and net veins visible on both leaf surfaces. Leaflets 3-8, almost equal-sided at base, 3½-6 inches long, 2-3 times as long as broad *F. Bennettiana.*



Right Methods in Dairy Practice.

M. J. GRIFFITHS, B.Sc. (Dairying), Dairy Research Laboratory (Dairy Branch).

MANY dairy farmers—especially those who have only recently established dairy herds—are unaware of the essential points for the satisfactory and cleanly production of milk and cream. With the object of assisting these, and of forming a reminder for more experienced dairy farmers, this article outlines the absolutely necessary precautions to be taken and discusses the general principles which must be followed consistently, if the best results possible on each farm are to be obtained.

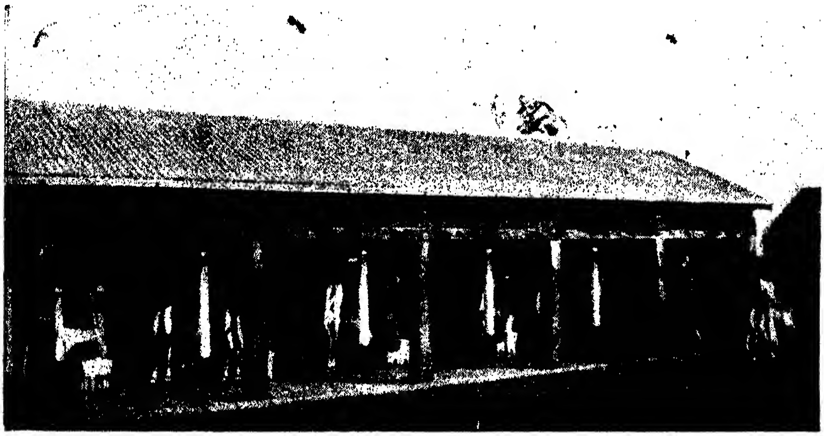


Plate 139.
Well-arranged and soundly-constructed milking shed.

The bacteria responsible for the spoilage of milk and cream are to be found in large numbers on every farm, and, even on carefully managed and well conducted premises, if correct dairying methods are not used, they may enter from any or all of the following sources—

(*a*) The udder, if the animal is not absolutely healthy, and if foremilk is not discarded.

(*b*) The cow's coat and skin, if not wet-groomed before milking, or if the surroundings are neglected.

(*c*) Dust in the cowshed or dairy.

(*d*) The milker's hands, clothes, or person.

(*e*) Milk buckets and equipment imperfectly cleaned, or not sterilised.

(*f*) Impure water, if used in the cowshed or dairy.

The health of the cow is, of course, of first importance, and the farmer must assure himself that every animal in his herd from which milk is being produced is in fit condition and free from any signs of disease.

Suitable buildings, as provided for under the Dairy Regulations, are essential. These need not be elaborate or expensive, but they must be hygienic in construction—that is, capable of being kept clean.

Cement or concrete, being impervious, washable, and durable, makes the best flooring. For cowsheds, working it to a very smooth finish on which the animals may slip, should be avoided.

The inside of the milking shed, including walls and bails, should be lime-washed frequently in order to keep it sweet, and manure should not be allowed to accumulate in the sheds or in the adjacent yards. The cows should not have to wade through a mire when approaching the sheds.

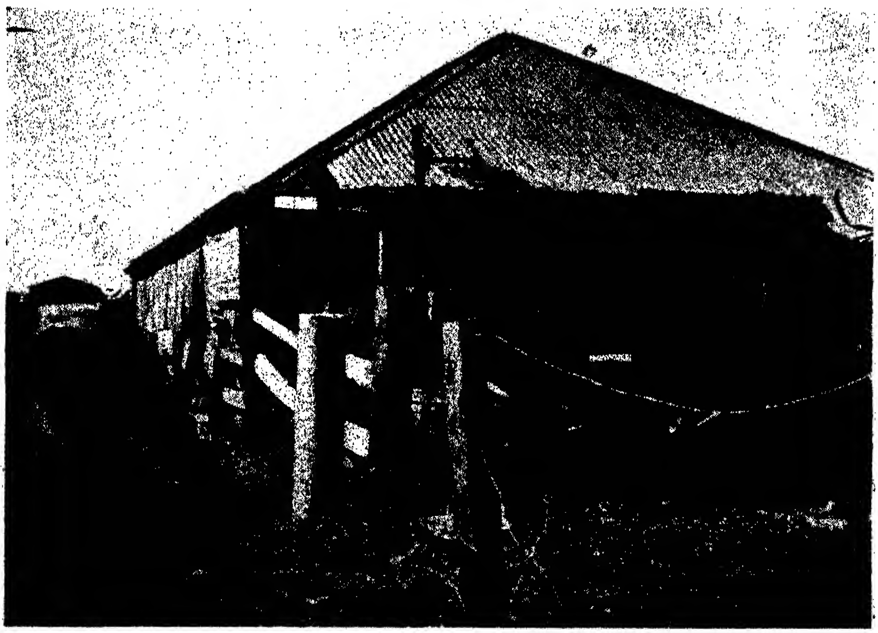


Plate 140.

This shed, over sixty years old, is not suitable in its present condition for milk production.

Dust should be kept down as far as possible in the milking shed; therefore dusty feed should not be given during milking, and if there is a fodder room attached, it should be divided off by a proper wall in which any opening is fitted with a tightly-closing door—a sliding door is very suitable.

Grooming the Cow.

Some preparation of the cow before commencing to milk is necessary, in wet weather to remove the mud and dung splashed on the udder and teats, and, under summer or drought conditions the dried dust, which is equally dangerous to milk quality.

The flanks and tail should be kept free from caked mud and dung by the occasional use of a currycomb, and the dust removed as often as necessary by grooming with a stiff brush dipped in clean water. It is a common practice on "model" farms to keep the hair on the flanks as well as the udder clipped short to avoid the collection of dust and dirt. Occasional clipping and regular grooming will make the daily routine

of keeping the udder clean a very simple task. It is only when cows have been neglected that the washing of udder and flanks takes any great length of time.

The udder and teats should be washed before each milking. This is best done with a cloth (preferably of the woven type) kept for the purpose, and a bucket of clean water, using a separate cloth, with a second lot of clean water if necessary, for finishing off the udder. A small amount of potassium permanganate (Condy's Crystals), or some chlorine compound added to the water is an extra precaution observed by many

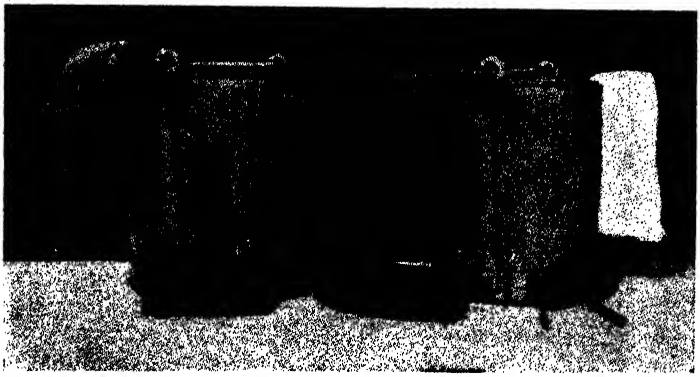


Plate 141.
Outfit required for keeping cows clean and well groomed.

farmers, which is advisable if there are any cases of sore teats, or where the water used is of doubtful purity. The teats are left damp, but not dripping, so that any remaining dust or loose hairs will adhere to the surface and not fall into the milk. Udder cloths must be washed out and boiled every day, otherwise they become a dangerous source of bacteria and the object of washing the udder will be defeated. Both cloths and bucket should not be used for any other purpose.

With practice, this routine preparation of the cow for milking can be very quickly and yet thoroughly carried out. It can be done by a boy, and the time spent—one minute or less per cow—is negligible compared with the reduction in the number of bacteria gaining entrance to the milk and cream from this source.

Discarding the First-drawn Milk.

The first step towards clean and, therefore, profitable milking is the washing of the cow's udder and teats to remove dust and dung particles and loose hairs, which, if they fall into the milk, carry with them enormous numbers of bacteria. The second is the removal of the first-drawn or "foremilk," which is a less commonly recognised source of troublesome organisms. The small quantity of milk left after milking within the narrow canal leading from the udder to the outlet of each teat forms a good breeding ground, where nourishment, moisture, and a suitable temperature are available for growth.

On account of their minute size, bacteria can penetrate past the "sphincter" muscle, which closes the teat when milk is not being drawn, and, especially in the case of older cows, where this muscle has become

slack, large numbers may enter and become established in the teat canal between milkings. Thus it is advisable, before milking is begun, to remove into a separate vessel—a small pail or billycan is suitable, but *not* a milking bucket—the first two or three streams from each teat. This will wash the teat canal free or almost free from contaminating organisms.

Plate 142.

Animals awaiting milking on a dairy farm producing clean milk. A clean well-made yard means clean cows, and manure can be easily collected from it for distribution on the land.

Experiments have shown that the foremilk, compared with the middle milk and strippings from the same cow, contains by far the largest proportion of the total bacteria, and, when it is considered that these may be from pasture, dung, soil, or contaminated, stagnant water, which contain particularly obnoxious types, the value of rejecting the first-drawn milk can be better realised. This has been found to be an important contributory factor in lengthening the life of milk, whether it is intended for human consumption, cheesemaking, or separation of cream for butter-making, and in avoiding bacterial taints and troubles such as ropiness and sweet curdling.

A far more important reason, however, why every farmer should make a practice of removing the foremilk regularly at each milking is that it enables him to notice anything abnormal in the appearance of the milk. Early indications of mastitis usually show up in the form of tiny clots or strings in the first-drawn milk, which if observed may mean the detection of animals having one or more affected quarters, before the disease becomes serious. Special care can then be taken to milk the infected cows last, their milk can be isolated from the rest, and the spread of the disease to other cows in the herd prevented.

Plate 143.

Plate 144.

These photographs show (in contrast with Plate 139) two neglected farmyards which in wet weather become foul and miry. Apart from contaminating the cows' coats, this means that the manurial value of any droppings is lost, for they cannot be removed.

Under no circumstances must the foremilk be withdrawn on to the floor of the milking bail, for this is one of the surest ways of spreading any infection that may be present. Apart from this, decomposition will take place with accompanying bad smells and attraction of flies.

It is well known that the highest percentage of butterfat in milk is contained in the strippings and that the first-drawn milk is the poorest portion, so that discarding it will involve only a small loss in quantity, which is more than offset by the improvement in keeping quality.

In large herds, where the quantity of foremilk is considerable, it can be pasteurised or boiled and used for calf, pig, or poultry feeding, unless definitely known to be infected. If it contains milk from diseased quarters, it should be disposed of by adding some disinfectant and emptying well away from cowbails and water supply.

The Milker.

Much contamination of a serious nature may enter milk if the milker happens to be careless as to personal cleanliness, or if he be unhealthy. No person who is known to be suffering from an infectious or contagious disease is allowed by law to handle milk or cream, for many of the common disease germs are known to survive in milk, and some are able to multiply, if conditions are favourable, with the result that the infection may be transmitted to the consumer. Large scale milk-borne epidemics are not common, but they have been known to become widespread and far-reaching in their effects before the cause is discovered; whilst it is probable that many small outbreaks or single cases remain undiscovered and unreported. In the interests of hygiene and national health, the dairy farmer should realise his responsibility in this direction, and keep a strict check on the workers employed by him.

Plate 145.

Milkers suitably dressed in washable caps and suits. They have hygienic metal milking stools.

He should also see that proper clothing is available for milking. The clothes of the milker may constitute a source of danger to milk quality, if, for instance, the same clothes are worn as for pig-feeding, fodder mixing, grooming the cows, and removing manure. A pair of overalls, or a sugar-bag apron, worn for milking only, and washed at least once a week, is within the reach of all, whilst a washable cap is an added protection.

The milker should wash his hands thoroughly before commencing to milk and after completing each cow. This avoids transferring bacteria picked up from the cow's coat, leg ropes, stool, or surroundings to the freshly-washed udder of the next cow. Adequate provision for washing the hands in the cowshed is essential—a basin or sink should be placed in a convenient position, and, if towels are used, care should be taken to see that they are an asset to the hygiene of the milking shed.

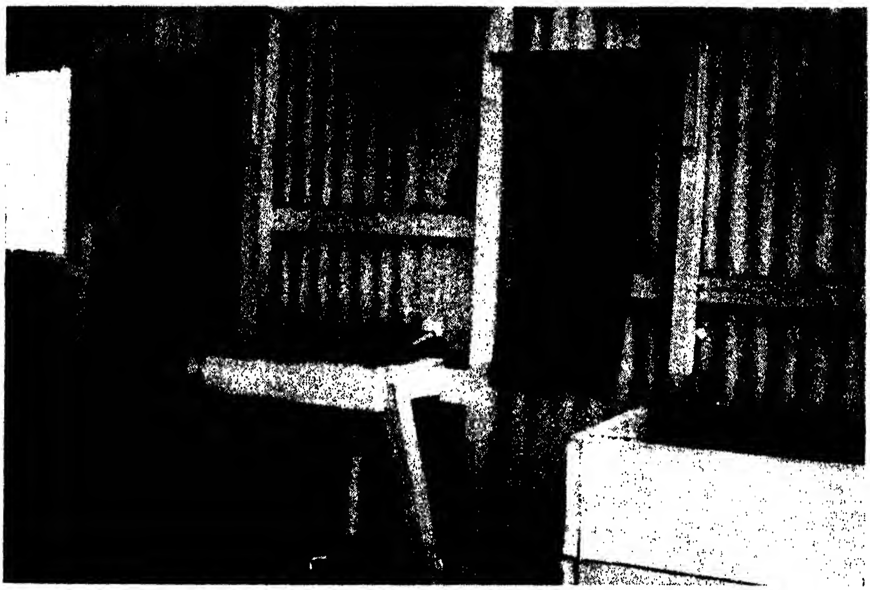


Plate 146.
Convenient sink with running water provided in the cowshed for the use of milkers. The towels receive daily washing and boiling.

On one farm recently visited, in the Brisbane area, the cowshed has a built-in sink and clean towels are provided daily for the use of milkers. This is an excellent arrangement.

Wet or Dry Milking?

Many milk producers, careful in every other way to avoid contamination, still continue the unhygienic practice of wet-handed milking. Moistening the hands with milk direct from the teat, or, worse, by dipping into the milk pail, is a deplorable habit, which is responsible for much contamination as well as loss of quality of milk and cream. It is, of course, more serious if washing of the udder and of the milker's hands have been neglected, for then the dirt becomes intimately mixed with and well distributed throughout the milk. A glance at the

accumulation between the fingers of a worker engaged in milking an unwashed cow wet-handed will be sufficient evidence of the truth of this statement.

Where washing of the udder and teats and discarding of the fore-milk have been carried out and the milker's hands have been washed, "wet" milking is less objectionable, but the fact remains that all the cleanest and most efficient up-to-date dairy farmers milk dry handed, and this is a necessity for the production of milk for sale as "Tuberculin Tested" or "Accredited" in England, and for the majority of organised milkers' competitions. "Dry" milking means that the hands are washed immediately before starting to milk and after completing each cow, being left slightly moist after washing, and are kept as free from milk as possible.

Some farmers, mostly those who have not persevered with dry milking long enough to give it a fair trial, object to it as being slow and difficult, especially as regards stripping. It has, however, been found by hundreds of others to be equally rapid and simple, after a little practice, provided that the hands are left damp and the teats sufficiently moist after washing to make them pliable.

It is true that there are individual cows with badly-formed abnormal teats, or with one or more sore teats, which are difficult to milk dry-handed. For dealing with these, the clean milker uses a small quantity of ordinary vaseline applied to each teat after washing, which not only serves as a lubricant but also assists in the healing of the damaged skin, and helps to prevent particles being rubbed off into the milking pail. Teat sores should be treated with some antiseptic ointment between milkings. This also prevents their becoming more serious through being worried by flies. Great care should be taken by the milker to wash his hands thoroughly after each cow, for, obviously, this is a great factor in checking the spread of infectious sores.

Vaseline may be found of assistance to the man who has made a long practice of wet-handed milking when he first attempts the "dry" method, especially in stripping. It is preferable to use vaseline if, by thus easing manipulation, it prevents excessive downward jerking of the teats, which is often resorted to by an impatient milker, and which is not only quite unnecessary, but ruinous to the delicate udder tissues. After a time, however, it will be found that dry milking can be carried out easily and rapidly with no lubricant other than the moisture supplied by washed teats and hands.

This is being done on hundreds of modern dairy farms, where greater efficiency and increased keeping quality are aimed at, and, once established, this method is seen to be far superior to the old, which appears unhygienic, messy, and insanitary by comparison.

Straining, Cooling, and Storage of Milk and Cream.

Temperatures on the average farm present a difficult problem in summer, but good dairy management depends largely on their regulation and control. The removal of animal heat from milk and cream as soon as possible after milking or separating, followed by storage in cool surroundings, will greatly lengthen their useful life by delaying the growth and multiplication of bacteria. Together with straining, which serves to remove the visible dirt and so reduce the numbers of micro-organisms, control of temperature forms a method whereby the farmer can definitely increase the value of his product.

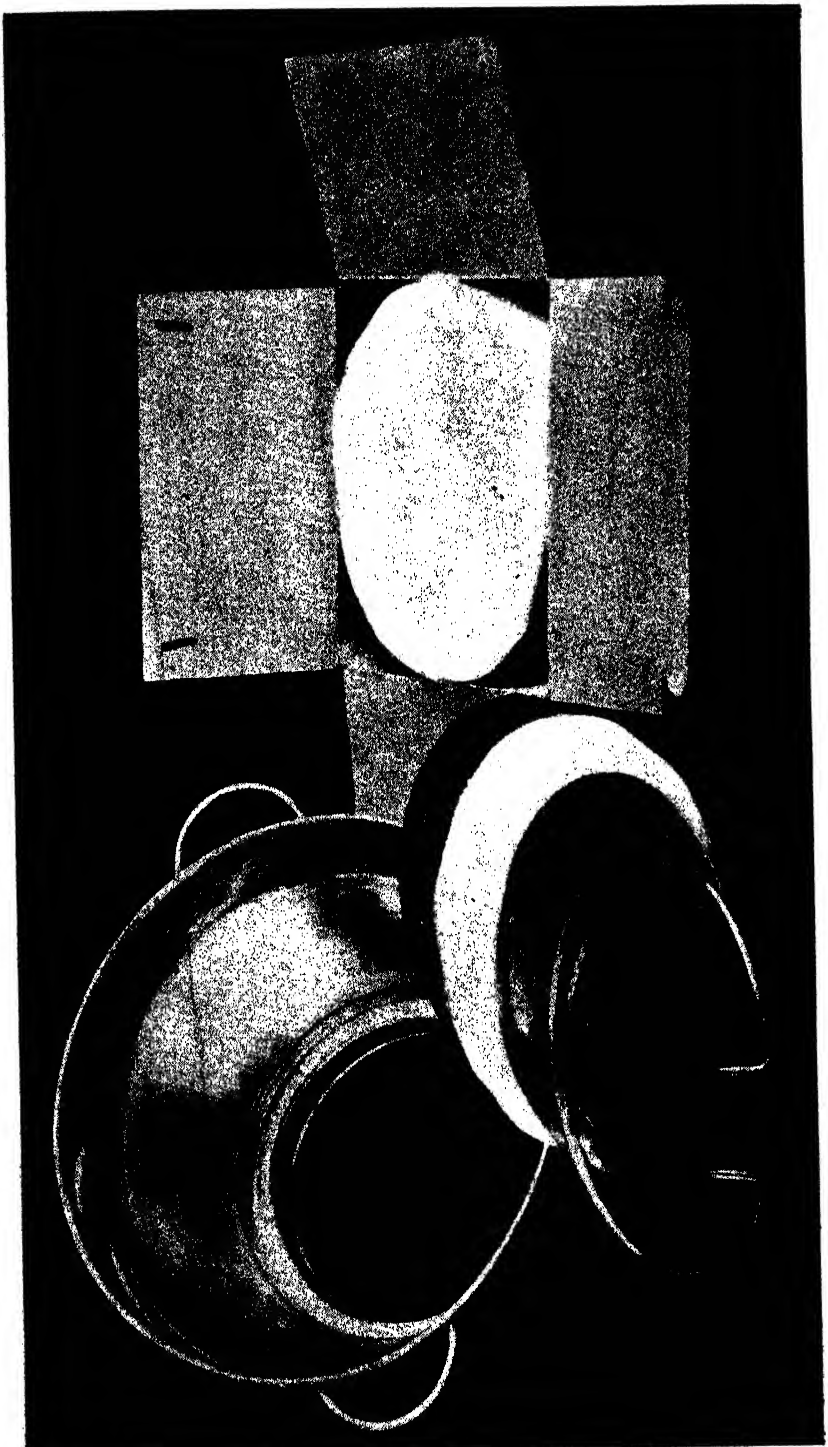


Plate 147.

Excellent type of strainer, easily cleaned and conforming to the Dairy Regulations.

Straining.—Cow-hairs, flies, dust, and dung particles and other foreign matter carry with them enormous numbers of bacteria, and should be kept out of milk by every possible means, for no amount of straining can remove bacteria once they have become free in the milk. Should some visible dirt gain entrance, however, the straining of each cow's milk through a cotton-wool disc immediately after milking will minimise the damage that may otherwise be caused.

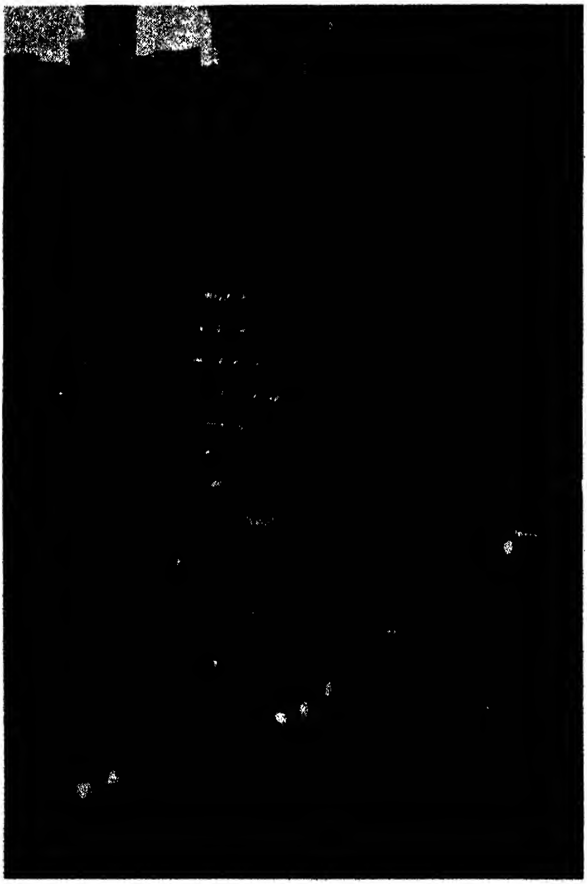


Plate 148.

An effective type of milk cooler circulating water which is then run to the stock trough.

Straining should be done once only, and should take place before cooling or separating. The disc type strainer prescribed by the Dairy Regulations is preferable to any other, since each disc is discarded after use; provided that the metal parts are scrubbed and sterilised, there is no risk of recontaminating the milk as with a cloth which has not received thorough washing and boiling; also, the finer mesh of the wad will trap smaller particles than will a cloth.

Cooling.—Some form of cooling is necessary to counteract rapid bacterial development, and the most usual medium for the purpose is water. Adequate water is necessary for cooling, and if the supply is

Plate 149.

Utilising cooling water for stock. The tank receives the water after it has passed through the milk cooler. The water is subsequently run to a stock trough in the paddock (see Plate 150).

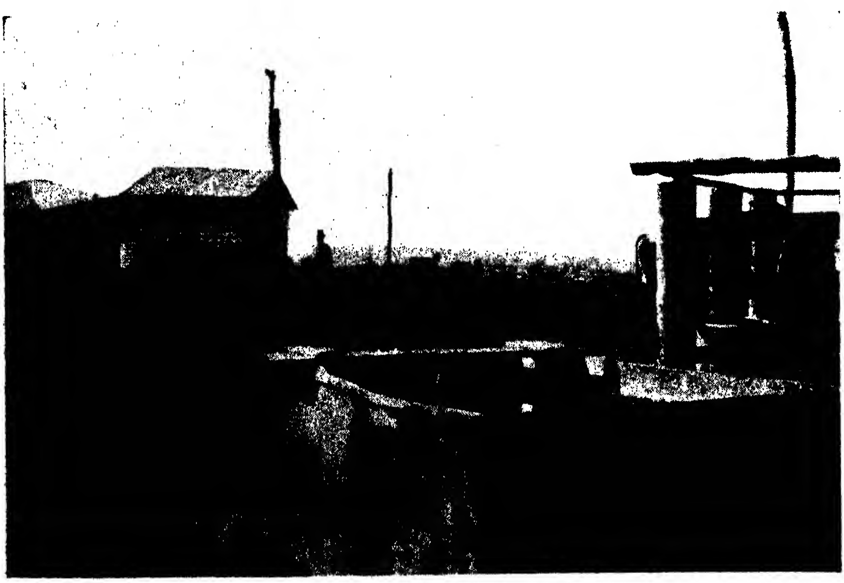


Plate 150.

Showing stock trough connected with the tank. Water from a supply main is available on this farm.

insufficiently cold an evaporating device or the use of ice may be required to bring the temperature of the cooled milk to 60 deg. F. or lower, and cream to 70 deg. F. or lower. If deep well water is available the maximum advantage in temperature can be obtained by pumping it direct to the cooler or trough when required. In the case of shallow well, surface, or tank water, some means of storing it, protected from the heat of the sun, must be devised if it is to be useful as a cooling agent.

An insulated tank, through which cold water flows and in which cream cans may be placed, is a fairly satisfactory arrangement for reducing the temperature steadily with constant stirring, which also aerates the cream; the water is then run to a trough for watering stock.

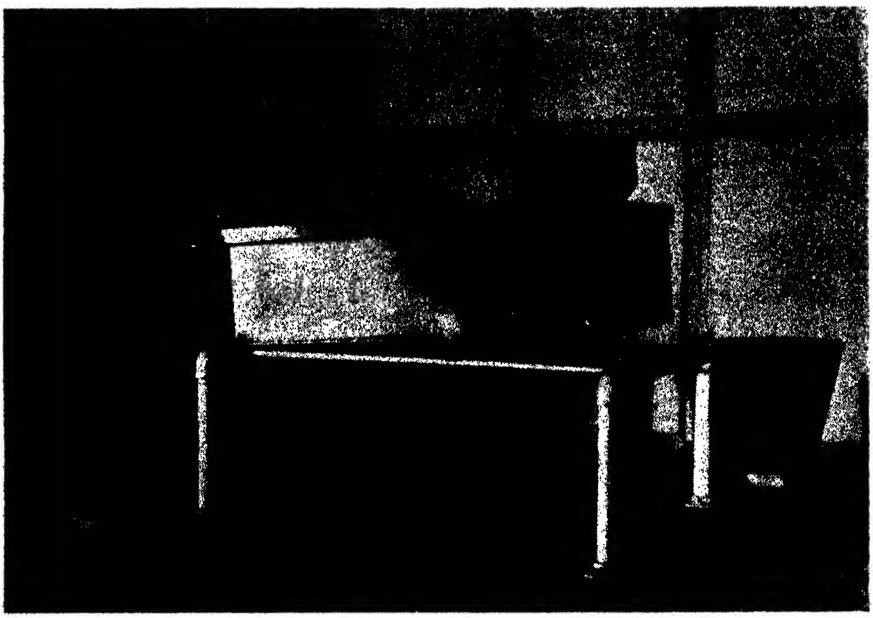


Plate 151.

A corner of the milk-cooling room, adjacent to the cowshed, on a well-managed farm where refrigeration is employed, showing strainer and covered receiving vat, milk pump, part of the cooler, and the thermometer.

For cooling and aerating milk, the best type of cooler is the endless corrugated type, which can be used in conjunction with a water-bag evaporator (filled after each cooling in preparation for the next), or with a fixed tank to which water is pumped and flows through the cooler by gravity, or with a refrigerating unit using brine. Such a cooler, having wide corrugations, can be easily cleaned with a brush and has no awkward crevices. Porous cylindrical containers large enough to hold a single can, working on the evaporation principle, are being used in some districts successfully, and have the advantage of being transportable and economical of water.

Refrigerating is a sure and certain way of improving quality, for, although it actually does not kill harmful bacteria, it renders them dormant and unable to cause deterioration of milk or cream. Many farmers are coming to the conclusion that the improvement in grade

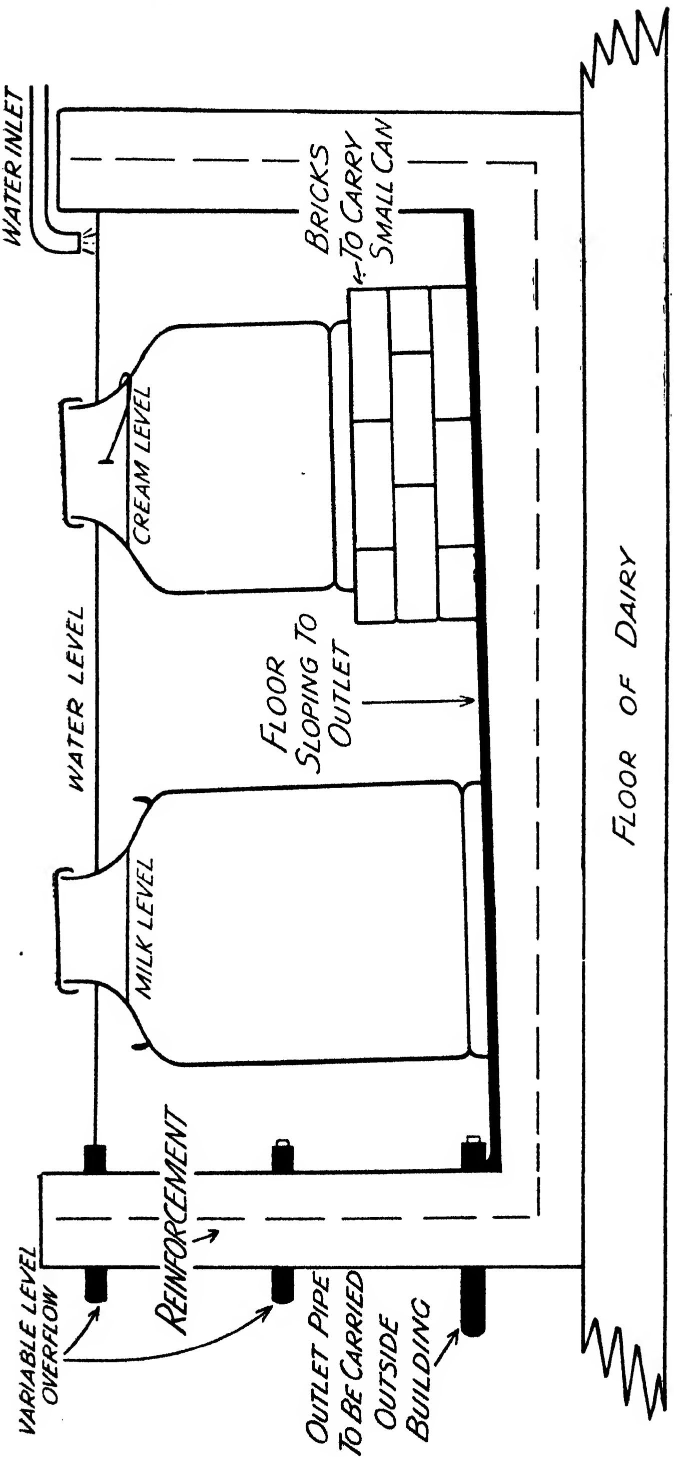


Plate 152.
Concrete trough for keeping cream cool in the dairy house.

resulting from refrigerating their product on the farm makes it financially economical. Very little bacterial growth takes place below 45 deg. F., but the growth rate of the common milk types increases steadily above this, up to around 100 deg. F., and is, of course, favoured by summer conditions. During sultry weather especially, extra care and precautions need to be taken with regard to cooling and cool storage of milk and cream.

Storage.—The Dairy Regulations provide for a suitable storage room (Dairy House A) for milk and cream, or for milk only, a well-covered ventilated stand will suffice. A clean wet bag wrapped around a can will assist cool storage by insulation and by evaporation. Direct summer sunshine in Queensland has tremendous heating power, and the proper protection of cream left adjacent to the road awaiting the carrier is, therefore, also important. Thick timber roofing over the cream stand affords greater protection than galvanised iron, which is not permitted under the Dairy Regulations.

Careful temperature control right from the start is the key to safeguarding quality in either milk or cream production, for whatever purpose they may be required.

Washing of Dairy Utensils.

The general principles underlying the proper cleaning of all metal milk utensils are very simple, and once understood they can be adapted to the requirements of individual vessels and apparatus used in dairying. For this purpose it is essential to understand something of the nature and composition of milk and its products. Milk is a complex substance consisting of water, butterfat, lactose or milk sugar, casein, albumin, and mineral salts. Cream contains the same constituents in different proportions, so that the problem of cleaning is confined to finding effective methods for the complete removal of fats, sugar, proteins, and salts.

The sugar and mineral salts, being mainly in solution, are almost entirely rinsed away in cold water, which will also remove a large part of the fat and proteins. Butterfat, however, occurs in the form of minute globules, and some of these adhere to the surface of milk vessels and require heat and emulsification before they can be washed off. Of the proteins, casein is in suspension in fresh milk (giving milk its white appearance), but it can be coagulated by acid or by rennet to form a solid curd, the hardness of which is increased by heating; albumin is in solution, but, like egg-white, it is readily and permanently solidified by the action of heat. Both these milk proteins possess considerable adhesive properties (casein is used commercially in the manufacture of paints and glues) and they will, *if the preliminary cold-water rinsing is omitted,* stick firmly to dairy utensils, where hot water washing and subsequent sterilisation will only harden them on the surface. Once fixed there, even in a very thin film, they form a protective layer where bacteria become lodged and breed, and where the sterilising heat cannot reach them, to the detriment of milk and cream quality. Similar protection is afforded by a layer of fat in the form of grease, which can be tested for by passing a finger over the surface of dairy equipment, and which is caused by using insufficient hot water, water at too low a temperature, or the lack of some soap or soda compound to free the fat.

There are, then, three stages necessary to the thorough cleaning of dairy utensils, as distinct from the sterilising, which must follow in order to destroy the harmful bacteria. These three stages are as follows:—

(1) *Cold Water Rinsing.*—Utensils should be well-rinsed as soon as possible after use. This is very important, for milk once allowed to dry is much harder to remove completely. Soaking in cold water for a reasonable time is advisable if washing is not to be done immediately—this will loosen all milk solids and facilitate washing.

(2) *Hot Water and Soda.*—Washing soda, caustic soda, soap, or soap powder are suitable cleansers for farm use (besides many proprietary preparations sold under trade names). Care should be taken to avoid cleansers containing any gritty substance, for this will permanently damage the surface by scratching, and will rapidly remove tinning. The water should be really hot, and enough soap or soda should be used to emulsify the grease, so that no globules of fat can be seen floating on the surface of the water. A stiff brush should be used on each utensil and all loose parts such as taps and strainer discs should be dismantled for scrubbing.

(3) *Hot Water Rinsing.*—A final rinse, using fresh hot water, is needed to remove the soda water before sterilising.

Milk utensils, if not properly cleaned and sterilised, are by far the most fruitful sources of contamination in the course of milking and handling milk and cream, and it should be remembered that both processes are equally essential, for satisfactory and complete sterilisation is not possible without first thoroughly cleansing along the right lines.

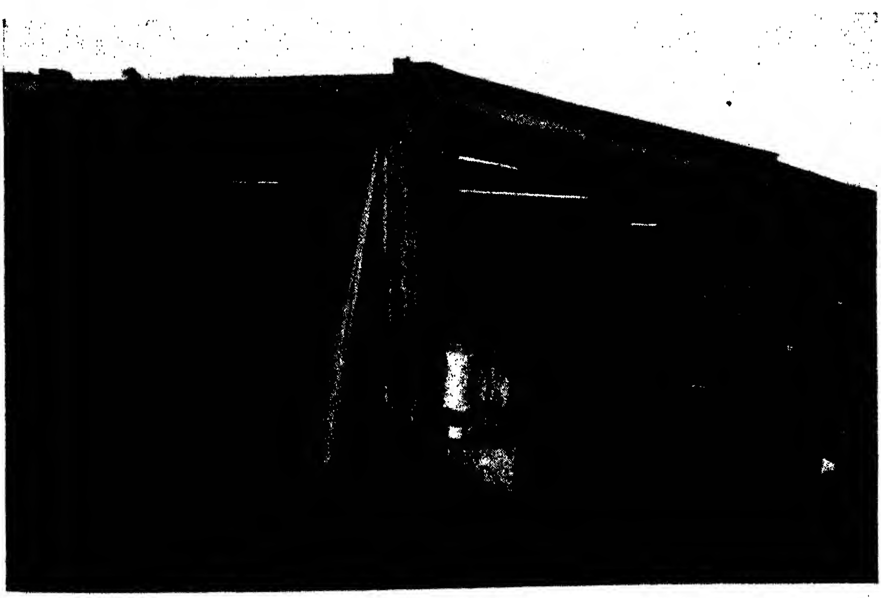


Plate 153.

This shed, used for chopping wood and as a laundry, is not a proper place for storing clean milk utensils.

Sterilising Dairy Utensils.

The use of clean sterilised equipment at every stage from the time that milk leaves the cow to the time of delivery to the customer or to the factory is considered the most vital single factor in lengthening the life of milk and cream. Some objections have been made to the Dairy Regulation dealing with the provision of a boiler on the farm to heat water for dairy use, but this is a minimum requirement in a country where warm or hot weather favours bacterial growth over nine months of the year. In Britain and other countries where dairies are required to be provided with a steam chest for sterilising milk utensils, this has resulted in a high standard, reliable product of good keeping quality.

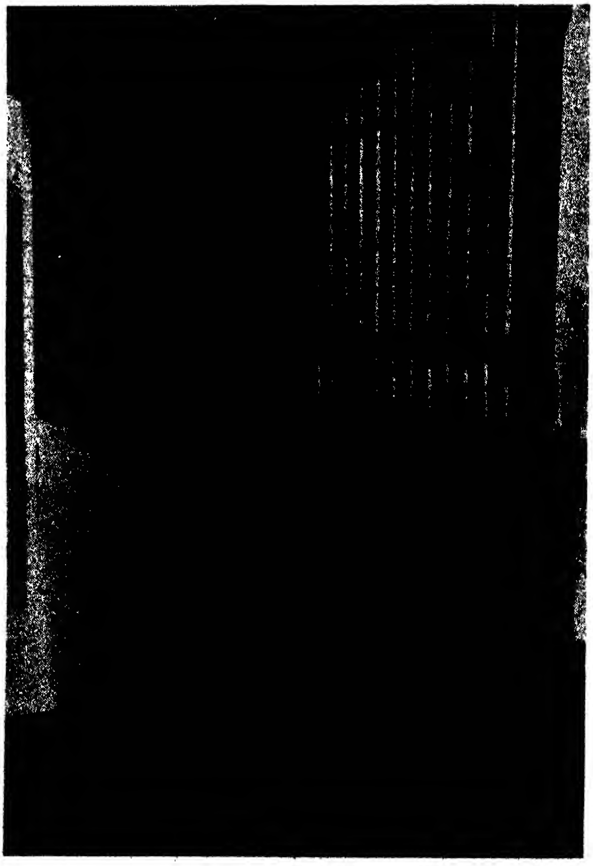


Plate 154.

Boiling water is essential for successful dairying. A convenient built-in boiler on a milk-producing farm; racks for utensils are nearby.

The initial expense is an investment, which has been proved countless times to be of the soundest. Farmers who have for years considered steam on the farm to be an extravagance have been completely converted, after installing a boiler, by the enormously improved grading and longer keeping of their product.

It is important to remember, however, firstly, that it is impossible to sterilise an inadequately cleaned vessel, whatever the method used, therefore the washing process must be thorough and complete before sterilising is attempted; secondly, that a worn or badly-constructed vessel cannot be either properly cleaned or sterilised. It is *essential* for good production that every utensil shall be free from rust, cracks, dents, open (that is unsoldered) seams—and for this reason kerosene tins are unsuitable—or other crevices, no matter how small, where traces of milk solids or moisture may collect and remain.

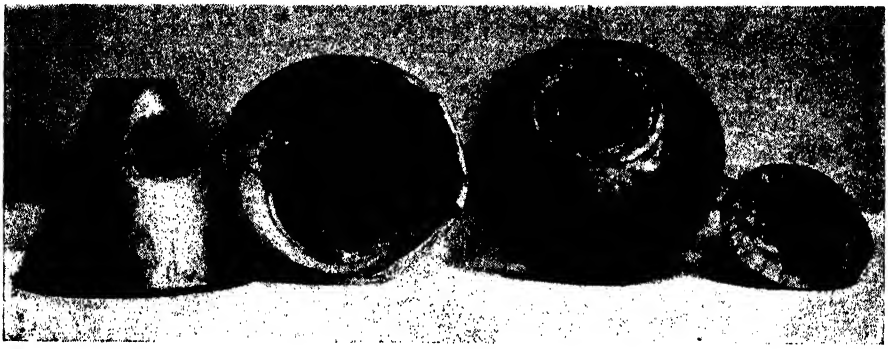


Plate 155.
It is impossible to clean or sterilise utensils such as these, which will seriously contaminate milk.

Chemicals.—Chemical sterilisers are on the market and there are some which are sold especially for dairy use. For milk utensils, however, chemicals are not, on the whole, recommended. Only a few are really suitable, if carefully used, and the risk of absorbed odours, of an error in quantity being made, or of some of the chemical gaining entrance to the milk or cream, are so great that heat sterilisation is considered generally more satisfactory and more efficient in every way.

Scalding.—"Scalding" is almost useless as a method of sterilising dairy utensils. If done with really boiling water, which is seldom achieved on the average farm, a proportion of the bacteria will be killed, but it is not a sufficiently severe treatment. Water which has boiled but which has lost some of its heat through standing is not a sterilising agent.

Steaming.—Steam is the ideal sterilising medium, and applied for fifteen to twenty minutes after washing is completed it will kill the majority of bacteria on all ordinary dairy utensils.

A small square chest with steam inlet and a tightly-fitting door, capable of holding cans, buckets, milking machine and separator parts, is an ideal sterilising unit. A thermometer, fitted in the side, enables the farmer to make certain that the temperature is actually 212 deg. F. for the required time. A simpler and inexpensive home-made steam chest can be made from an ordinary galvanised iron dust bin, by perforating the bottom, or from a 40-gallon oil drum used in conjunction with a wooden lid made to fit over the dairy boiler. A number of holes are bored in the lid, over which the drum is placed, the ends having been carefully removed. One end forms the lid of the "chest," into which utensils can be packed, and provided plenty of water is kept

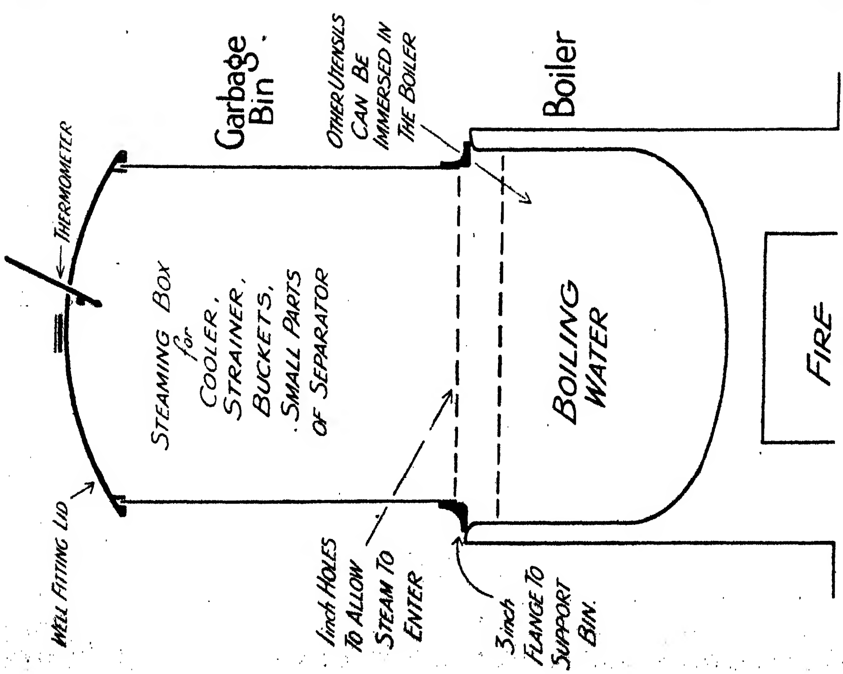


Fig. 1.

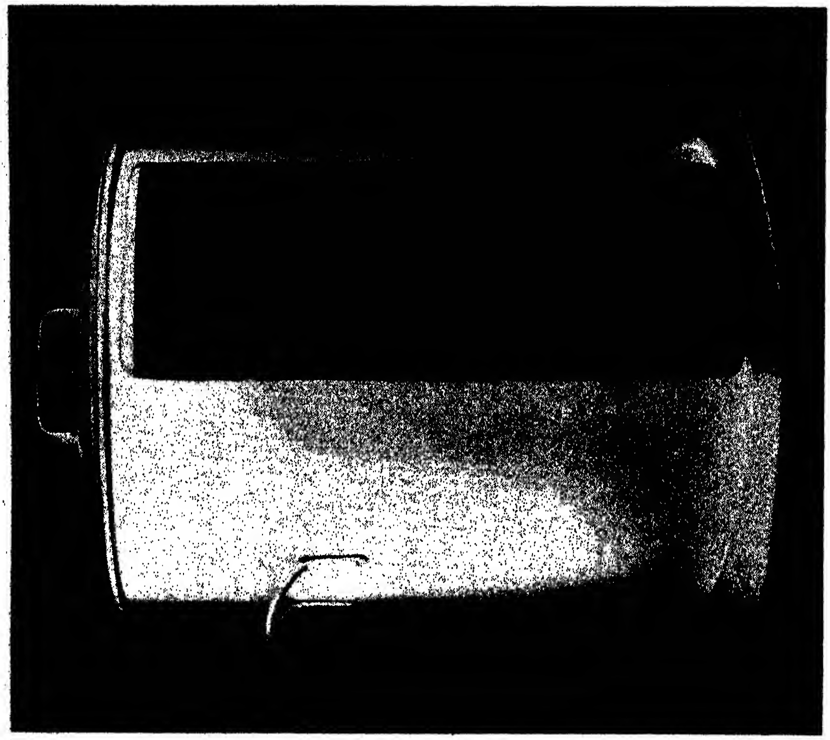


Fig. 2.

Plate 156.

Photograph and diagram showing construction of a cheap and effective steam steriliser.

boiling—twenty to thirty minutes time should be allowed—steaming can be satisfactorily carried out. A piece of sacking placed over the top will assist in conserving the heat.

Boiling.—Boiling by complete immersion in water which is actively bubbling is the only effective and satisfactory alternative if steam is not available. This should be done for *not less than ten minutes*, and on no account should any attempt be made to dry utensils by wiping after sterilisation. If they are drained in a clean, airy place, preferably on a rack where air can circulate, the heat of boiling will dry off most of the surface moisture in a few minutes.

The application of a cloth or any handling of the inside of a vessel which has been sterilised will result in recontamination and should be guarded against. A wire basket can be constructed, with a little ingenuity, from fine mesh netting, in which small parts of utensils can be held for boiling and can be allowed to dry, without handling.

Sunlight is an aid to drying and sterilisation, and where there is reasonable freedom from dust, the storage of clean utensils in a sunny spot is all to the good.

Care of Milking Machines.

Milking machines although they have revolutionised dairying methods, may, if mishandled or neglected, constitute one of the biggest menaces to milk and cream quality that the dairy farmer has to face. Many people hold the opinion that clean milk of good keeping quality and choice grade cream cannot be produced with a machine, but this has been investigated fully and both research work and practical experience have proved that it is wrong. As good a quality of milk can be produced by machine as by hand, provided the correct procedure is followed in care and cleaning.

Another objection often brought forward is that the machine tends to increase udder trouble. This is, of course, true if the farmer fails to notice cases of infection as soon as they occur and allows diseased cows to be milked by the machine. The great importance of inspecting the foremilk for any abnormal appearance has already been discussed, and any cow showing signs of mastitis in the first-drawn streams should be milked out by hand and the milk isolated from that used for human consumption. Cows with sore teats should also be milked by hand, although the machine may safely be used if they are left until last. A machine is very unlikely to cause teat sores—in fact, one Queensland dairy farmer with a large herd has experienced complete freedom from them over six months since he started machine milking—but it is liable to transfer the infection if used subsequently, without sterilisation, on other cows.

The solution of most milking machine troubles lies in proper cleaning and sterilising after each milking. It is essential that cleaning should be done promptly after milking is completed before the milk solids have time to dry on the rubber parts, for once dry they are far more difficult to remove completely. The first machines were crude inventions made with ordinary rubber parts which were easily cracked and pitted by the action of fat and hot water, making them excellent breeding places for contaminating bacteria. Nowadays the modern machines are solidly built and the rubbers are of the very best quality resistant to high temperatures, so that they can safely be boiled and even sterilised regularly by steam, without injury.

The method of dealing with milking machines, using a weak solution of caustic soda in boiling water, is well adapted to Australian conditions, and has proved economical, rapid, and successful. This method is as follows:—

(1) One gallon of clean *cold* water is drawn through each set of teat cups by suction, lifting the unit up and down in a bucket of water to allow air to mix with it.

(2) The outsides of teat cups and rubber tubing are then washed and brushed in *warm* water and caustic soda.

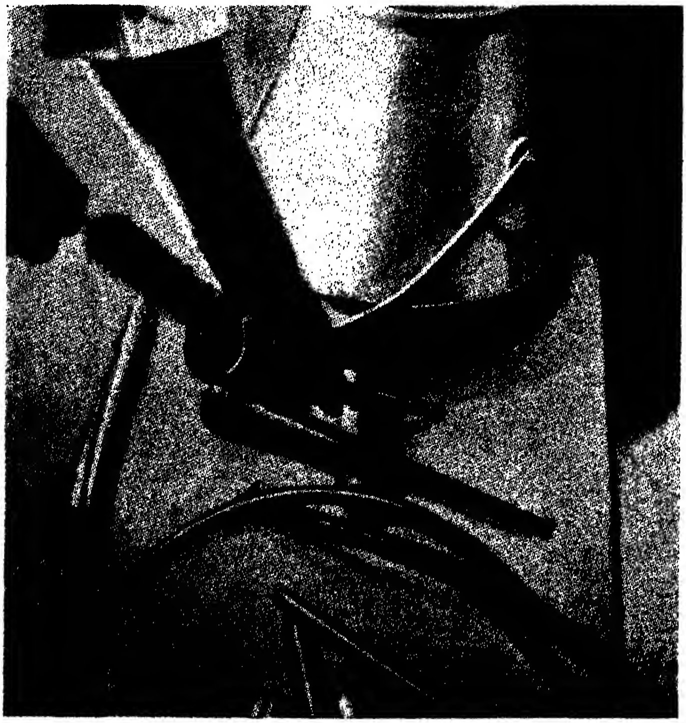


Plate 157.
Method of cleaning dismantled machine rubbers and small parts.

(3) At least one gallon of *boiling* caustic soda solution is drawn through each separate set of teat cups, holding them so that all receive equal treatment.

(4) The solution is removed completely by drawing at least 2 gallons of *boiling* water through each set of cups.

(5) If steam is available this is applied for five minutes to complete the sterilisation.

Strength of Solution.—One full teaspoonful of caustic soda added to every 4 gallons of boiling water is the correct amount and, provided this strength is not exceeded, no damage will be done to the machine, and satisfactory results will be obtained. Used carelessly, however, caustic soda is dangerous in its action, and care is needed in handling it

and in making up the solution. The water used must be really boiling to achieve proper cleansing and sterilisation, and by this treatment the resistance of the rubber parts to cracking is actually increased.

The vacuum line is often a source of trouble, and should receive a complete flushing once each day with boiling water, care being taken not to flood the pump. All taps should be left open when the machine is not in use, and the teat cups should be hung up in a cool dust-free place. The use of chemicals other than in the washing process has

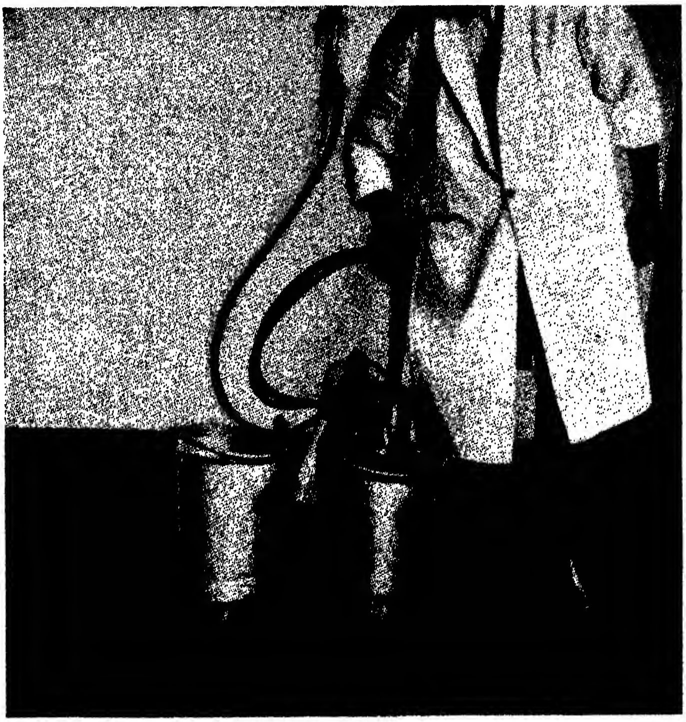


Plate 158.
Method of cleaning milking machine units after each milking.

been found to give less certain results than boiling water and steam, and there is great danger of traces of them finding their way into the milk and cream and causing taints.

Whatever method of cleaning machines is employed, they must be completely dismantled at least once, preferably twice, a week for satisfactory results.

Farm Water Supply.

It is extremely important that the supply of water on the dairy farm should be of pure quality and sufficient for requirements. Many farmers fail to realise that a contaminated water, if used for washing the cows' udders, the hands of the milker, or the utensils, may result in dangerous bacterial infection of the milk or cream. If cows and other stock are allowed access to foul or polluted water, not only will they wade collecting unclean bacteria on the coat and udder, but they will drink it if a good fresh and pure supply is not available in adequate

quantity, and in this way the spread of disease will be increased. The average milking cow is estimated to need 12-15 gallons of drinking water daily—this amount may not be sufficient in summer or in the case of heavy milkers—and experiments have proved that where cows have been allowed unlimited fresh drinking water, the milk yield has shown an increase.

Deep well water, provided it is not heavily mineralised, is the most satisfactory type of supply, for coming from far below the surface it is usually very pure and has the advantage of a low temperature all the year round. This is especially useful for cooling purposes in the dairy.

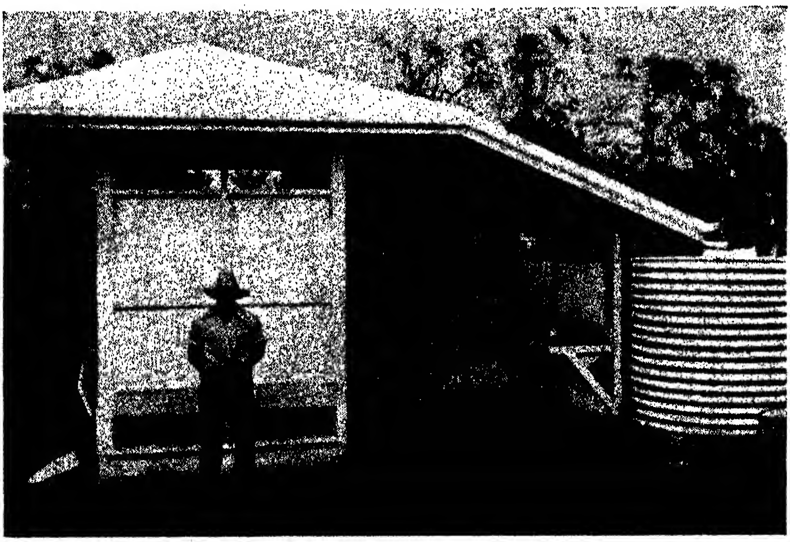


Plate 159.

Well-planned and constructed dairy house with veranda for washing and storage of utensils, and tank water supply.

Shallow wells may yield a good quantity of water which is usually soft, but it is frequently impure owing to its proximity to the surface; surface rain water cannot receive sufficient filtration through the soil layers by the time it reaches the shallow well level to free it completely from contamination. Pollution from surface drainage is commonly found in shallow well water, but this does not mean that it cannot be made use of on the dairy farm. It does mean, however, that either chemical sterilisation or boiling must be resorted to in order to purify it.

Tank water is the most common form of supply on Queensland farms, and in comparatively dust-free areas this water may be of a high standard of purity, but this is not always so, for where much dust settles on roofs or after a dry spell, the water is bound to wash off a great deal of sediment and with it undesirable bacteria. This applies especially to tanks attached to the milking bails, for water collected from these roofs is liable to be contaminated with manure dust and particles blown from the stock yard, making it unsuitable without treatment for dairy purposes. The practice of rinsing clean cans on their return from the factory with such cold untreated water

has been known to contaminate them seriously; instead they should be thoroughly scalded out with boiling water and allowed to drain dry.

Farm water treatment must be simple and cheap, and two methods are recommended.

(1) *Boiling.*—Boiling is the simplest method of purifying a suspected supply. If water is brought up to the boil (210 deg. to 212 deg. F.) before use, the bacteria causing ropiness and other faults will be destroyed, together with coliform (dung) types and disease organisms. Every farmer should provide himself with a dairy thermometer so that he can check temperatures, for the correct heating of water and utensils and cooling of milk and cream are the secret of successful dairy management.

(2) *Chlorination.*—Sterilisation of water by means of some chlorine compound is quite satisfactory provided the right amount is used. A quantity giving 1 *part of chlorine in 2 million parts of water* will sterilise any ordinary supply, leaving no excess. Where cloudiness or sediment are present, as may be the case if tanks are not cleaned, or with shallow well water, a larger amount of the compound may be needed than with a clear water, but care must be taken not to overdose with this powerful chemical since any excess will cause a bad taint in milk and cream. Addition of the chemical to water in the tank once a week, and after rain, should serve to keep the supply in good condition.

The periodic cleaning out of all water tanks is essential to maintaining a pure supply, and should not be neglected.

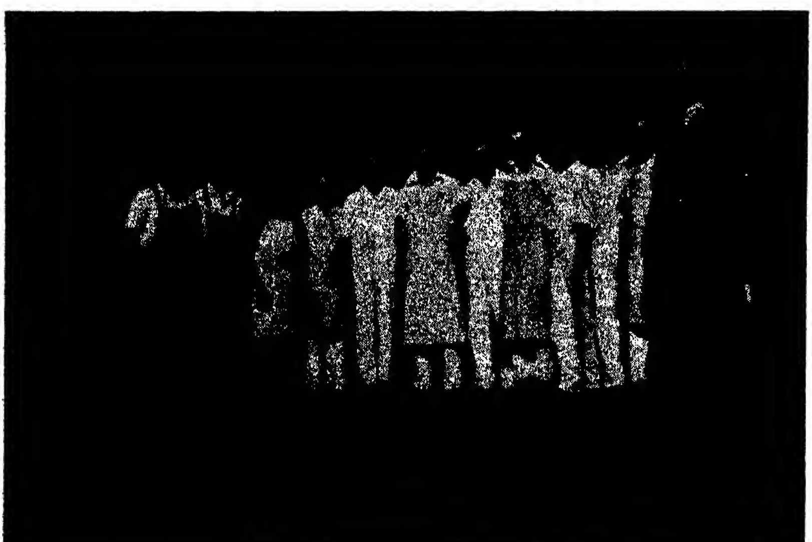


Plate 160.
Group of operatives at a Queensland butter factory.

New Rural Legislation.

LEGISLATIVELY, the present session of Parliament is an important one for farmers. No fewer than five measures have been introduced for the purpose of improving the conditions of country life in Queensland. They are: The Rural Development Bill, The Dairy Produce Acts Amendment Bill, Veterinary Medicines Act Amendment Bill, Apiaries Bill, and the Sugar Experiment Stations Acts Amendment Bill.

The Rural Development Bill is a measure to provide for the co-ordination of the administration of provisions regarding State advances to co-operative companies, associations, and primary producers, and advances generally in aid of primary production by the creation of the Corporation of the Bureau of Rural Development; and for other incidental purposes.

The Dairy Produce Bill is really the result of experience gained since the Dairy Act of 1935 was passed. That Act aimed to improve the quality of dairy produce and to ensure proper supervision over the production, handling, and treatment of milk and cream.

While the existing law has succeeded within the scope of its application, it has been found that it does not cover every contingency. Therefore, it has become necessary to strengthen the section dealing with cream transport, and provide for more effective control over the carriage of cream.

The production of choice grade butter has greatly increased in Queensland, but it is sought under the Bill to still further improve butter quality. To do that, of course, some control over the health of of dairy herds is necessary. So the Bill provides for widening the scope of the veterinary officers of the Department of Agriculture and Stock to enable them to test dairy stock for disease.

The object of the Veterinary Medicines Bill is to tighten up the control of the sale of veterinary medicines in Queensland. Lists of approved medicines will be published from time to time, and will be a guide to stock owners as to whether a stock medicine is true to label and has the virtues claimed for it.

The Apiaries Bill aims to make some differentiation between the commercial and amateur beekeeper and it is a concrete recognition of the principle that the man who makes his living keeping bees must receive first consideration in any legislation governing the honey production industry. The districts in which the new measure will take effect are Moreton, Darling Downs, Wide Bay, and Burnett.

The Bill relating to the sugar industry is designed to provide more effective control over the introduction and spread of cane diseases by declaring disease-infected areas and constituting cane disease control boards on the same lines of the existing cane pest boards, and with similar powers.

Every one of these Bills was welcomed by both sides of the House as an important contribution to the well-being of the rural industries of the State.

Export Bacon Pigs at the Brisbane Show.

REPORT ON THE 1938 COMPETITION.

THE class provided by the Royal National Association at its 1938 exhibition for export bacon pigs suitable for the English market was conducted on similar lines to the 1937 competition, a report of which was published in the *Queensland Agricultural Journal*, October, 1937.

Prize money of £40 was again provided for the class, of which £25 was presented by the Department of Agriculture, by direction of the Honourable the Minister, Mr. F. W. Bulcock, plus a special prize of £10 presented by Dr. Graham Brown, of Brisbane, for the exhibitor of the pen of pigs attaining the highest aggregate of points awarded in the two judgings.

Ten entries of three pigs each were exhibited and were first judged alive at the showgrounds on the 15th August, the judge, Mr. D. C. Cameron, using a score card which provided 70 points for condition, 20 points for uniformity and type, and 10 points for general appearance.

On the 22nd August the pigs were slaughtered at the Brisbane Abattoir, and after being chilled were judged on the adopted English system of carcase appraisal (see the *Pig Breeders' Annual*, 1936-37, or the *Queensland Agricultural Journal*, August, 1937).

In the report on the previous year's competition there appears the following statement: "When it is possible to judge carcases, there is little, if anything, to be gained by judging the pigs alive, for in judging the live pig the judge must use his imagination to some extent and in the class under review it must be considered somewhat fortuitous that the pens awarded first and second alive gained the same awards in the carcase competition"; this contention (i.e., that there is no advantage in this competition in judging the live pigs) is borne out in the results of the 1938 competition where none of the first, second, and third prize pens of live pigs is among the first three places in the carcase-judging.

In last year's competition the majority of the pigs were much too fat; this year, whilst there was a fair amount of the same trouble the marks gained for backfat show an improvement.

The most obvious fault with the majority of the pigs in this competition is the deficiency in body length, the average marks gained by the thirty pigs for this feature being only 33 per cent.

The detailed awards for each pen of live pigs and for each individual carcase are shown in the tables herein, the percentage marks for each feature of the carcase giving the best indication of value. The photographs of each entry as live pigs, whole carcases, and as one side and the section of the opposite side at the last rib, provide information of value to interested people.

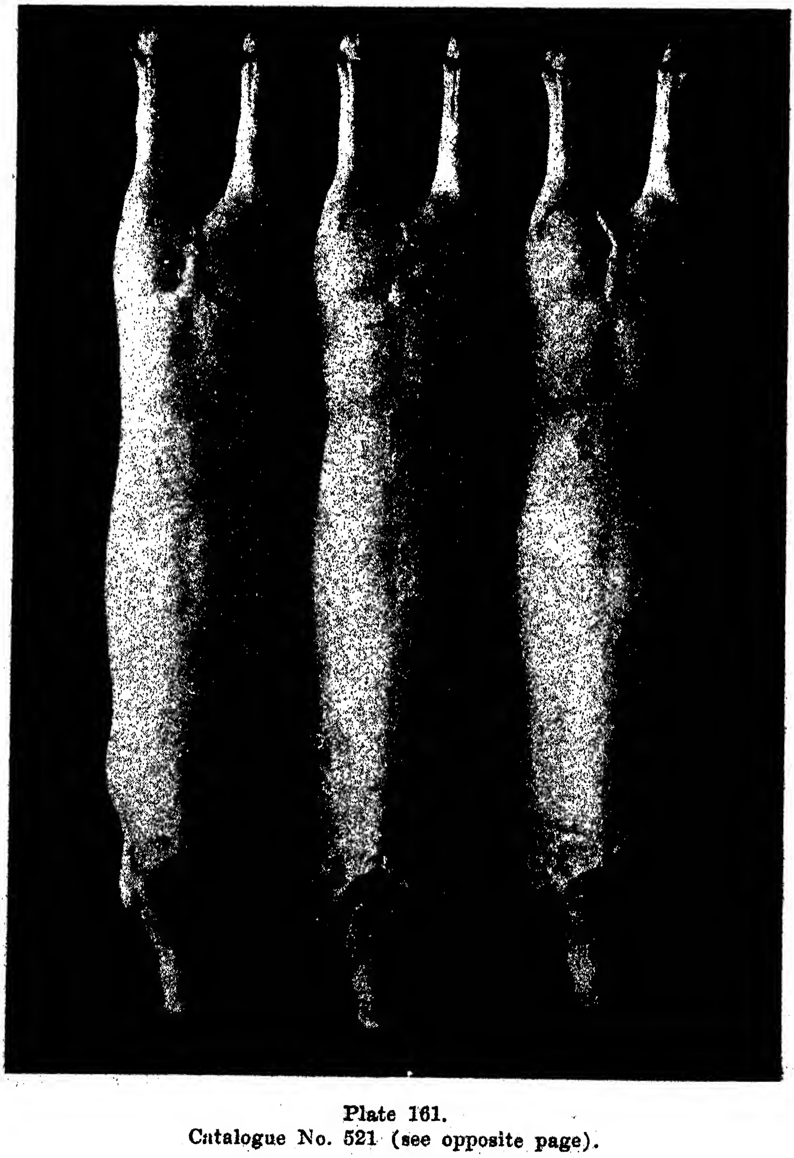


Plate 161.
Catalogue No. 521 (see opposite page).

Plate 162.

Catalogue No. 521, the first prize exhibit in the carcase section and winner of the aggregate prize, exhibited by Mr. S. S. Appleby, Maroon. These were Large White pigs which, when dressed, were uniformly good and measured consistently well in all respects excepting body length, which was their weakest feature.

The dressed carcase weights from left to right are 129 lb., 137 lb., 137 lb. These carcases show the correct degree of finish and a good distribution of fat and lean.

Mr. Appleby's entry of Large Whites won this class last year.

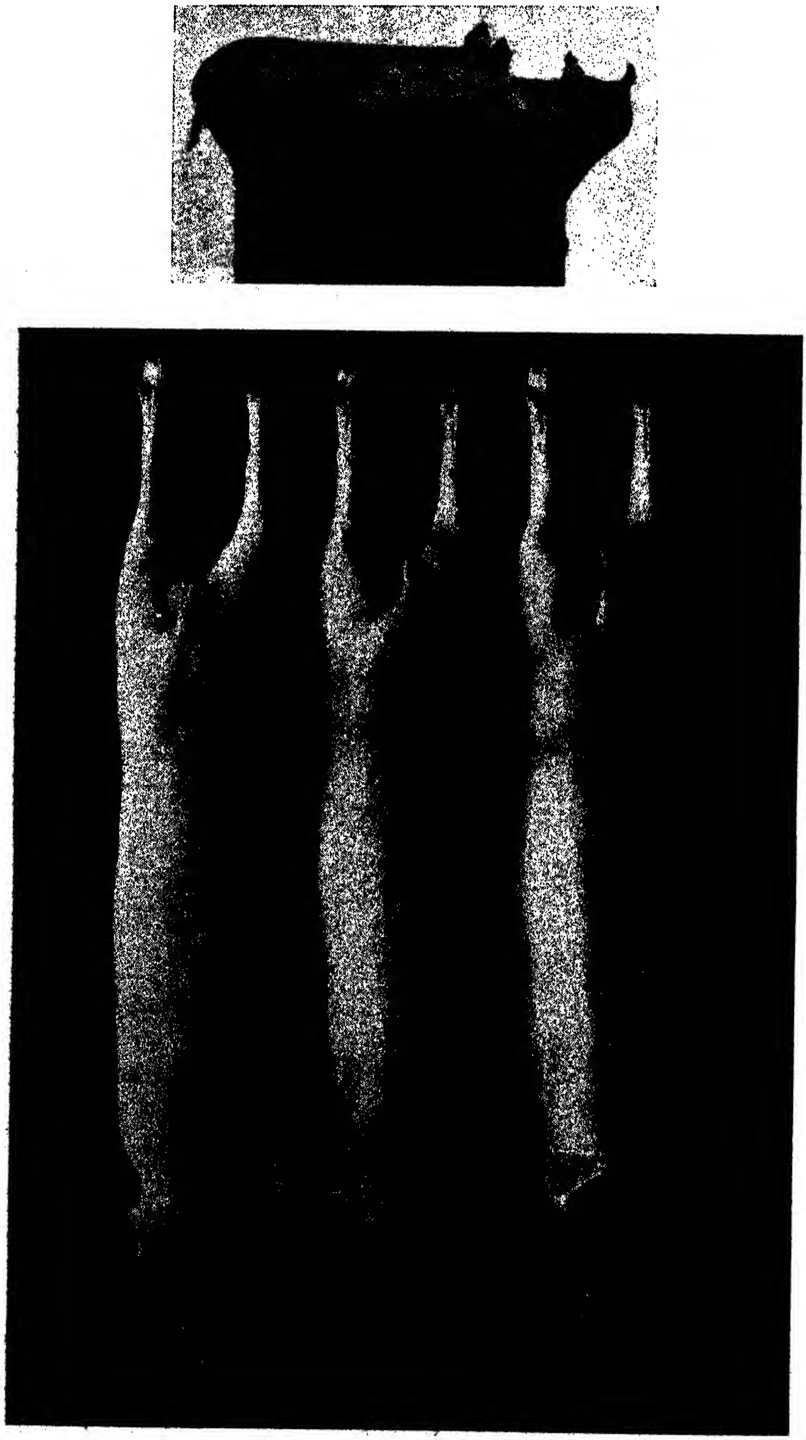


Plate 163.
Catalogue No. 522 (see opposite page).

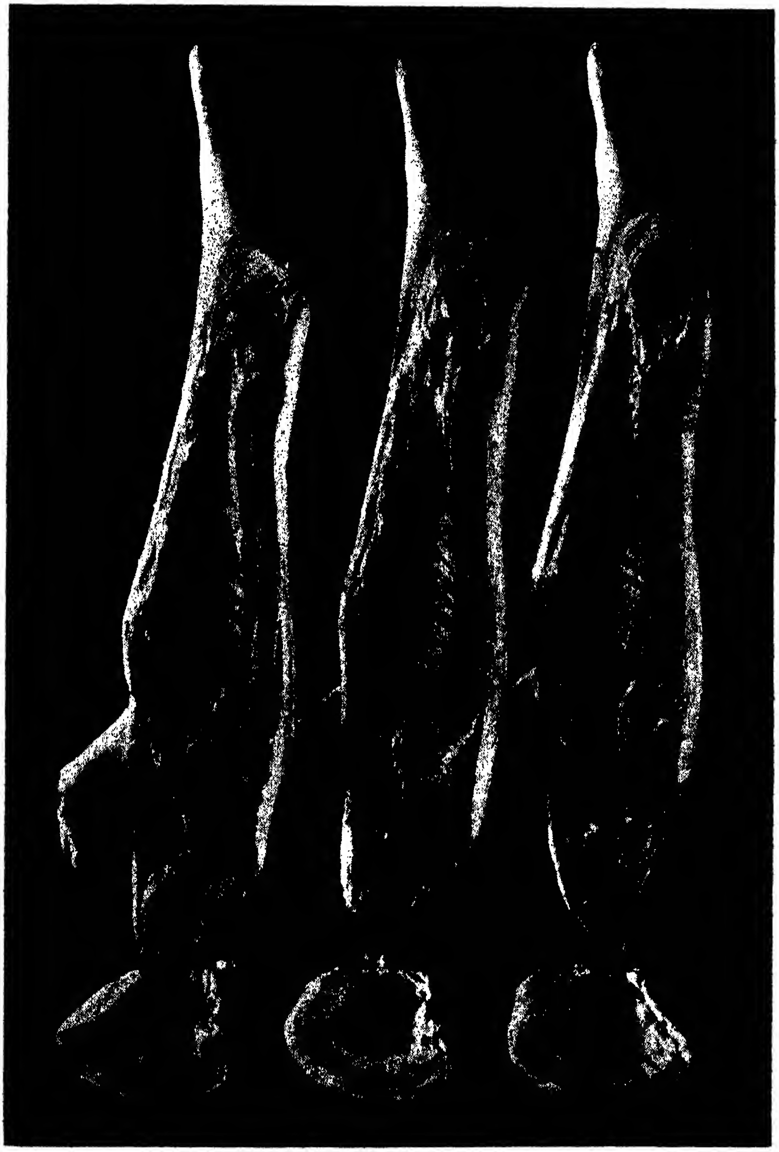


Plate 164.

Catalogue No. 522, entry of Large White x Duroc Jersey-Tamworth, shown by Mr. H. E. Badke, Beaudesert. These pigs were placed first when judged alive, but when their carcases were measured they were found to be much too short in the body in proportion to their weight. One pig was also very deficient in muscle development and too long in the legs.

The dressed carcase weights from left to right are 159 lb., 155 lb., 155 lb.

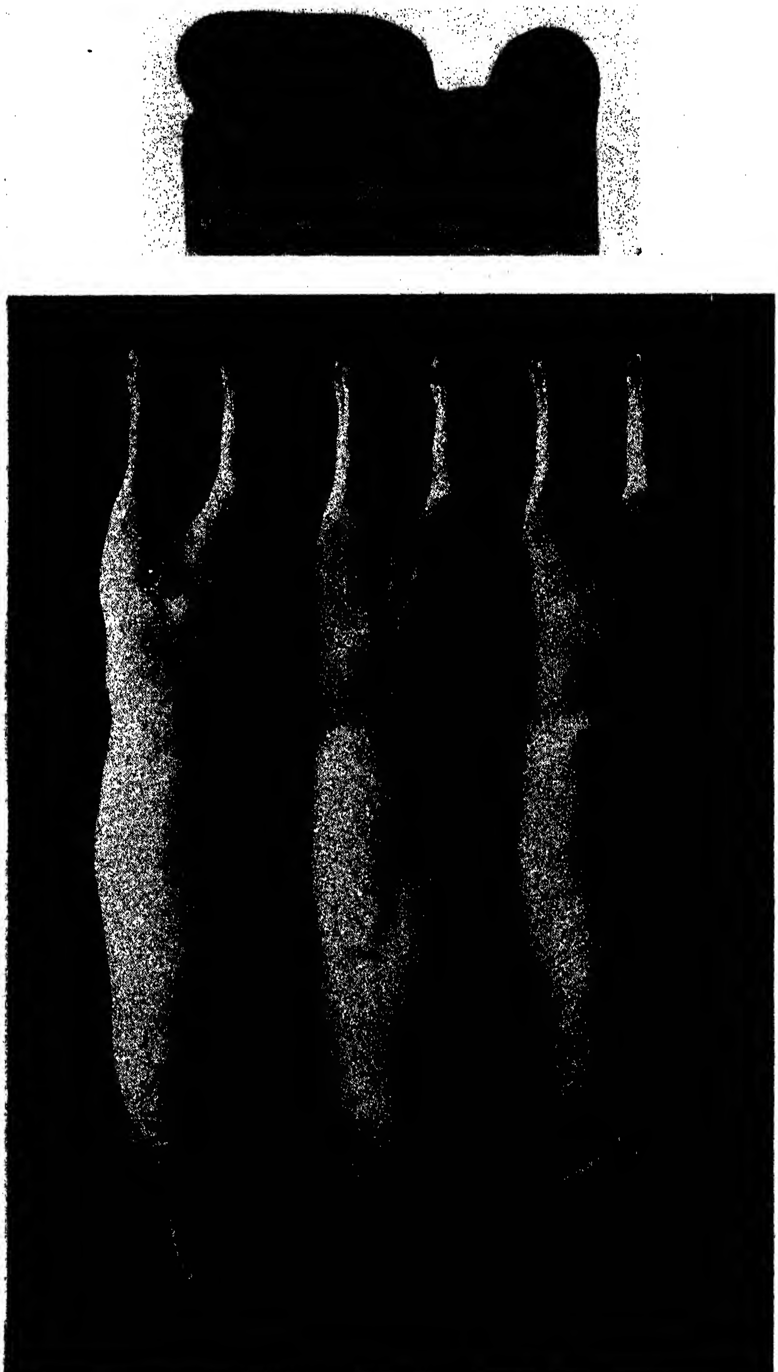


Plate 165.
Catalogue No. 523 (see opposite page).

Plate 166.

Catalogue No. 523. This was a pen of Large Black or Large Black crosses entered by Mr. H. E. Buhle, Boonah. These pigs were very much too fat and so lost many marks in the streak, backfat thickness, and body length.

The carcase weights from left to right are 173 lb., 176 lb., 171 lb.

These pigs were last in the awards.

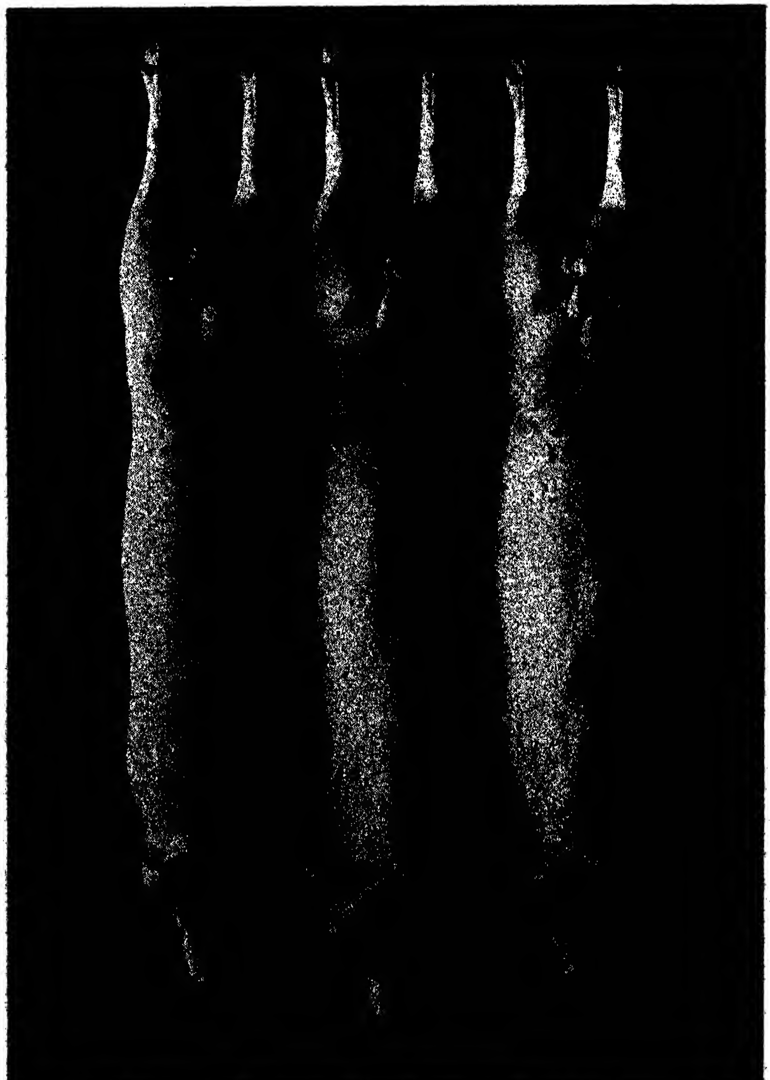


Plate 167.
Catalogue No. 524 (see opposite page).

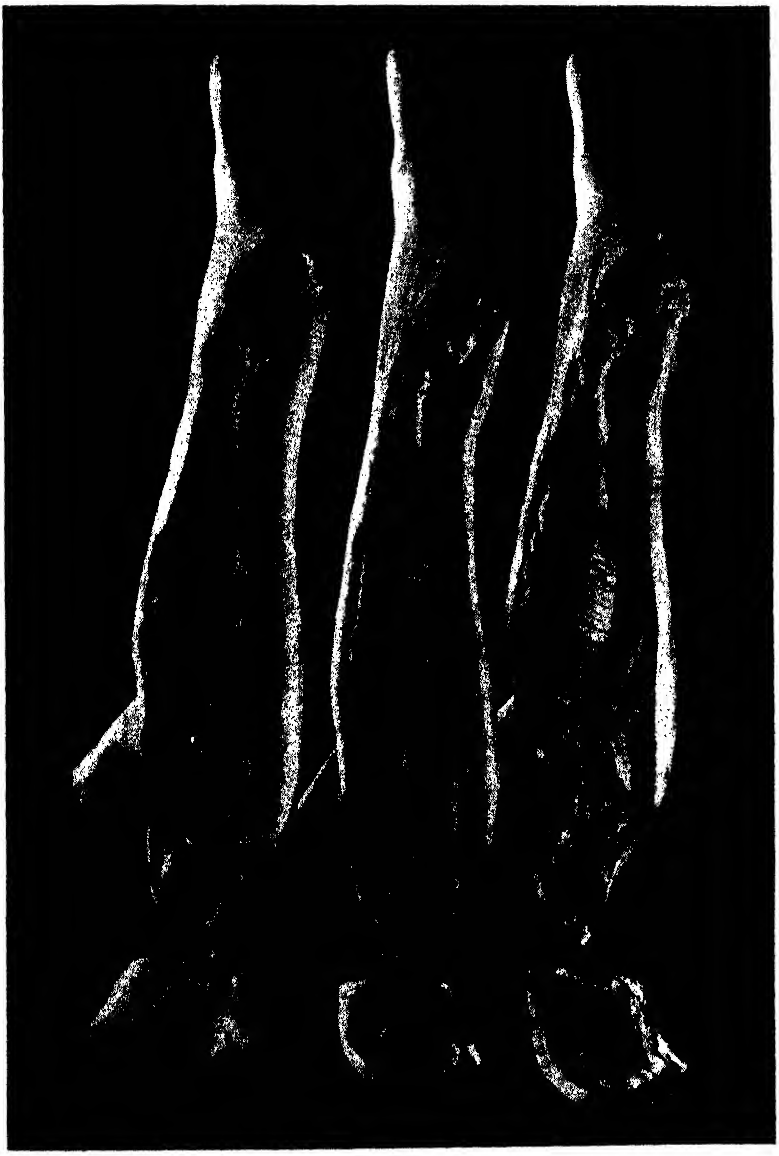
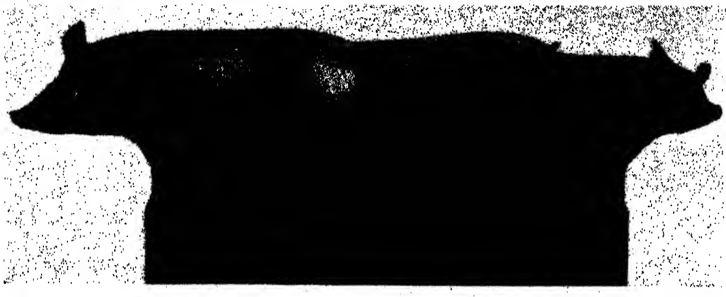


Plate 168.

Catalogue No. 524, an entry of Large Whites exhibited by Mr. J. A. Heading, Murgon. These pigs gained third place in the live judging, but after slaughter the pigs weighing 152 and 147 lb. were found to be too fat, and these two carcases lost heavily in marks for backfat and body length. The other carcase scored well, gaining a total of 71.8 per cent.

The carcase weights from left to right are 152 lb., 155 lb., 147 lb.



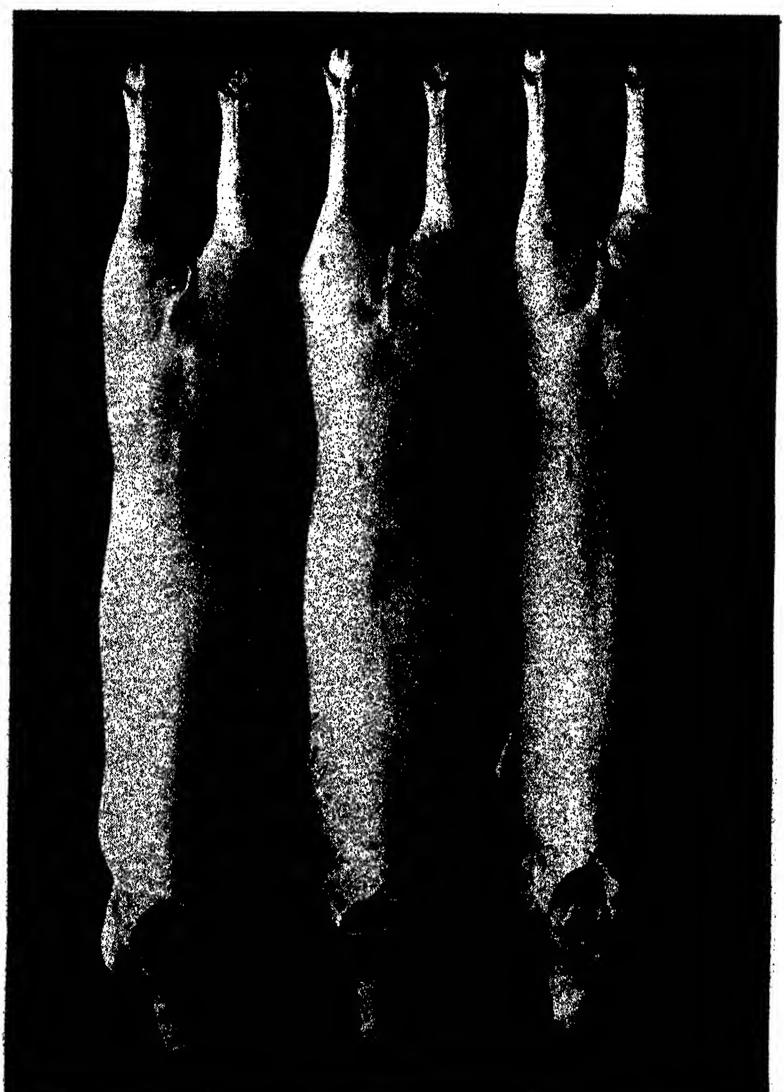


Plate 169.
Catalogue No. 525 (see opposite page).

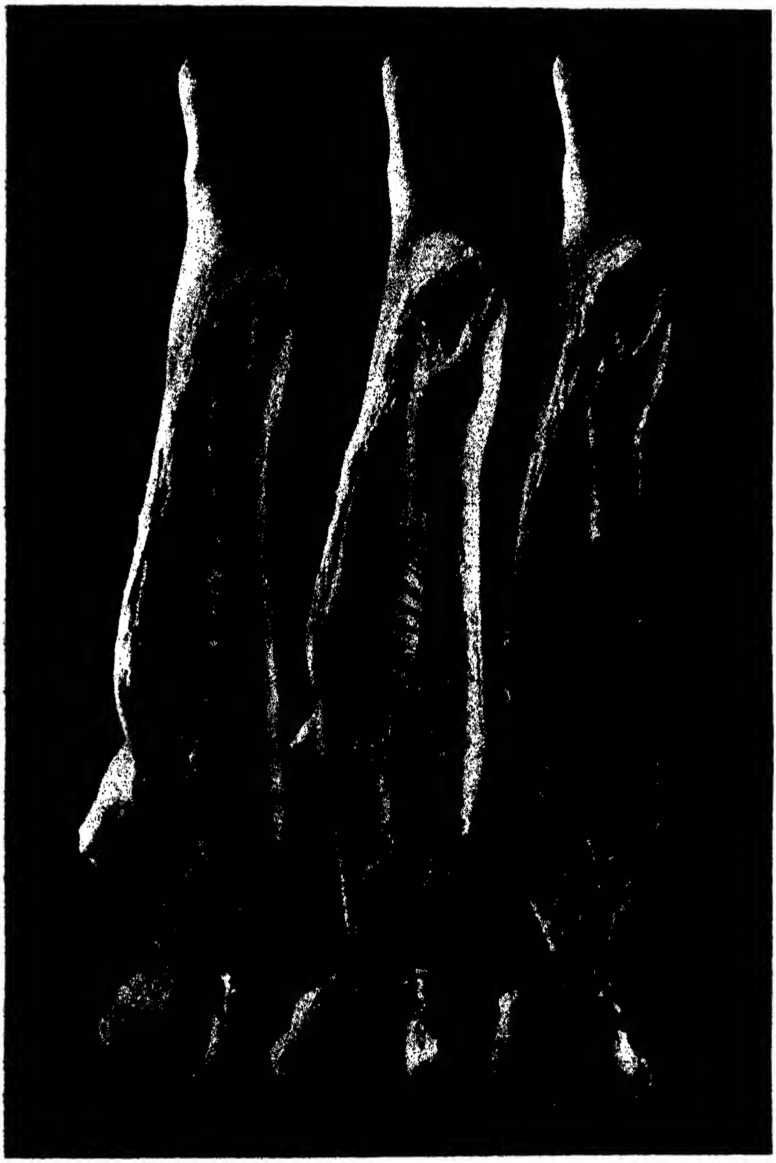


Plate 170.

Catalogue No. 525, an entry of Large Whites exhibited by Mr. J. M. Newman, Caboolture.

These carcases were somewhat uneven and came sixth in the carcase section.

The carcase weights from left to right are 152 lb., 168 lb., 143 lb. The 168-lb. carcase is too fat, and the 143-lb. carcase is too thin.

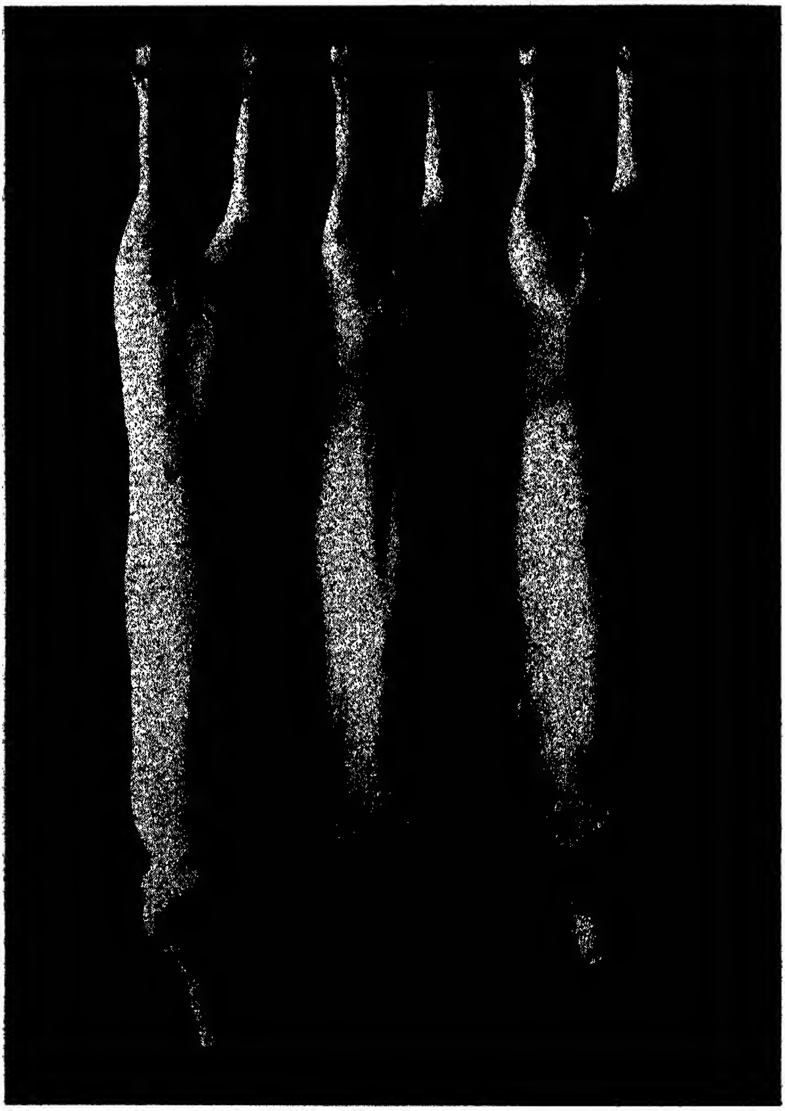


Plate 171.
Catalogue No. 527 (see opposite page).

Plate 172.

Catalogue No. 527 were Large White x Middle White, exhibited by Messrs. C. W. Thiele and Sons, Bundaberg. These pigs were deficient in the hams but scored well for their light shoulders. They were long, lean pigs and came second in the carcase class and in the aggregate.

The dressed carcase weights from left to right were 142 lb., 123 lb., 134 lb.

These pigs scored the highest marks for body length and for backfat thickness; the lightest pig was somewhat immature and so lost points on muscle development.

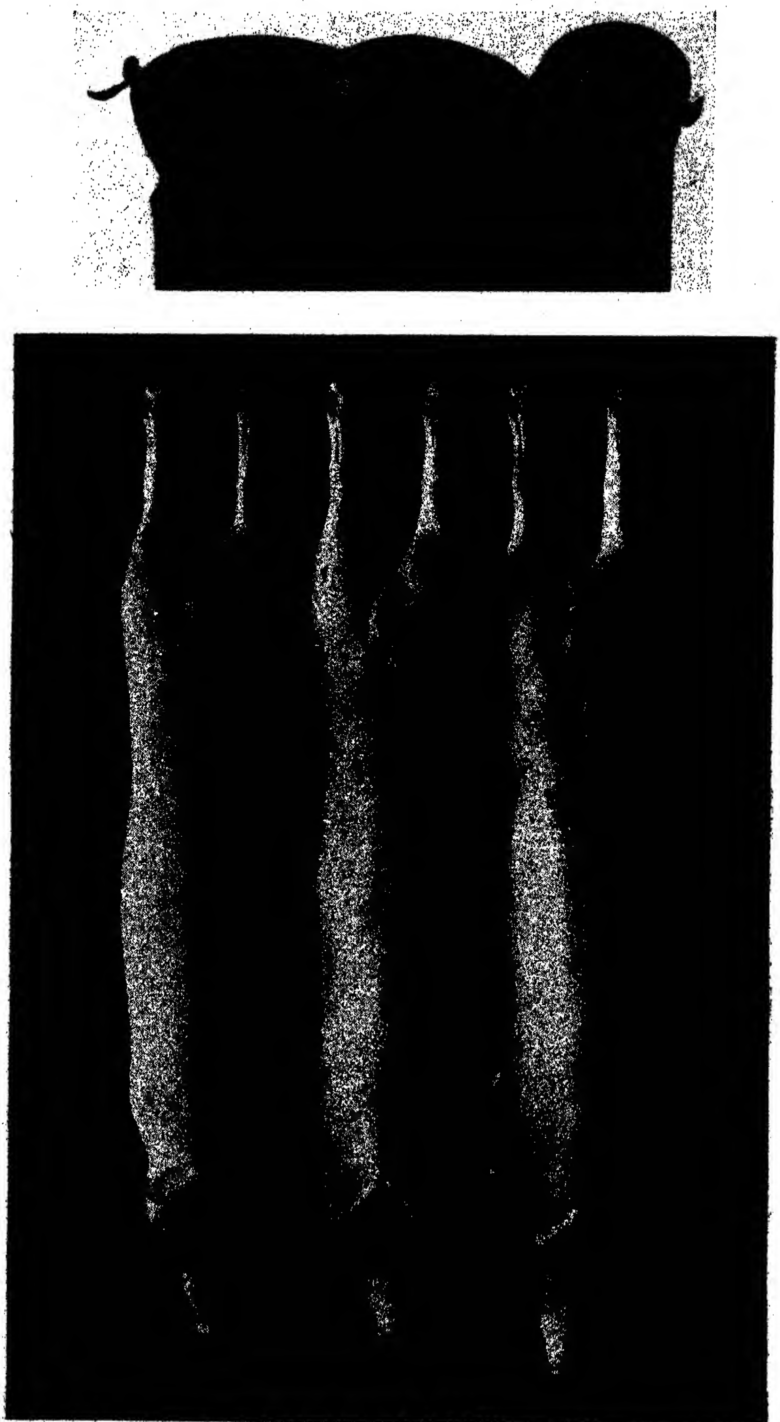


Plate 178.
Catalogue No. 528 (see opposite page).

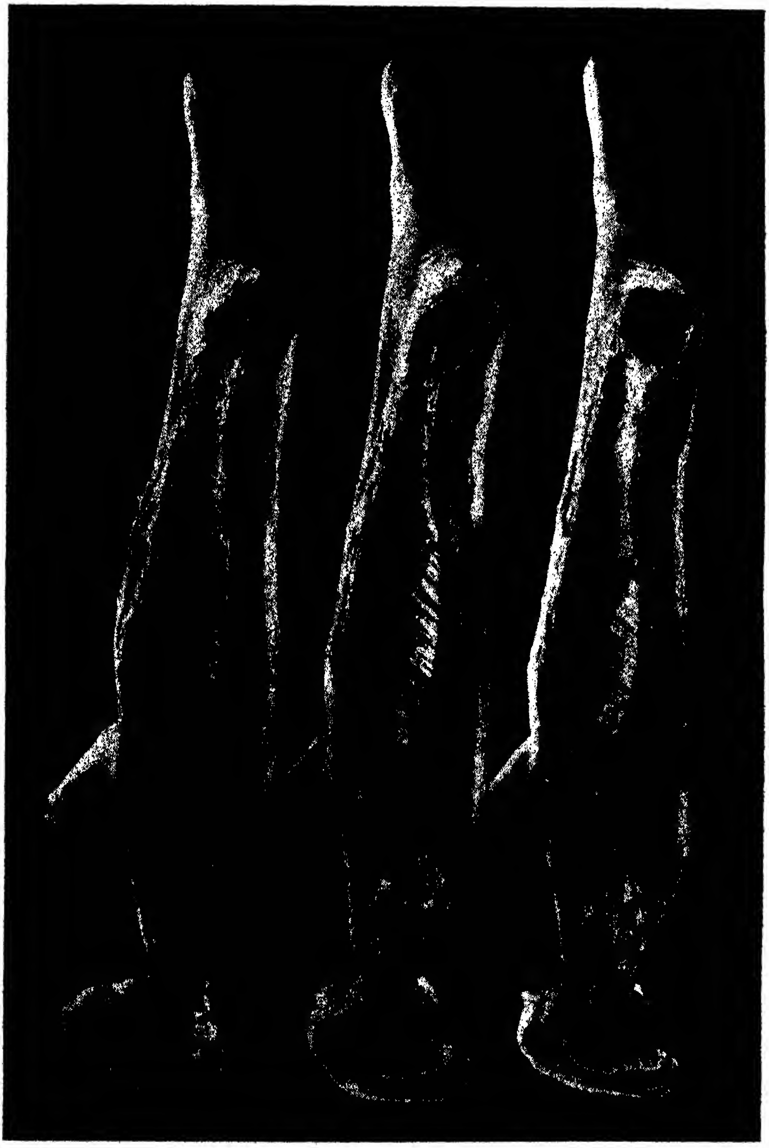


Plate 174.

Catalogue No. 528 were Large White grades, shown by Messrs. C. W. Thiele and Sons, Bundaberg; they were placed third in the carcase class and in the aggregate.

The dressed carcase weights from left to right are 143 lb., 148 lb., 151 lb.

These pigs scored fairly well throughout, their best features being the backfat thickness and the streaks.

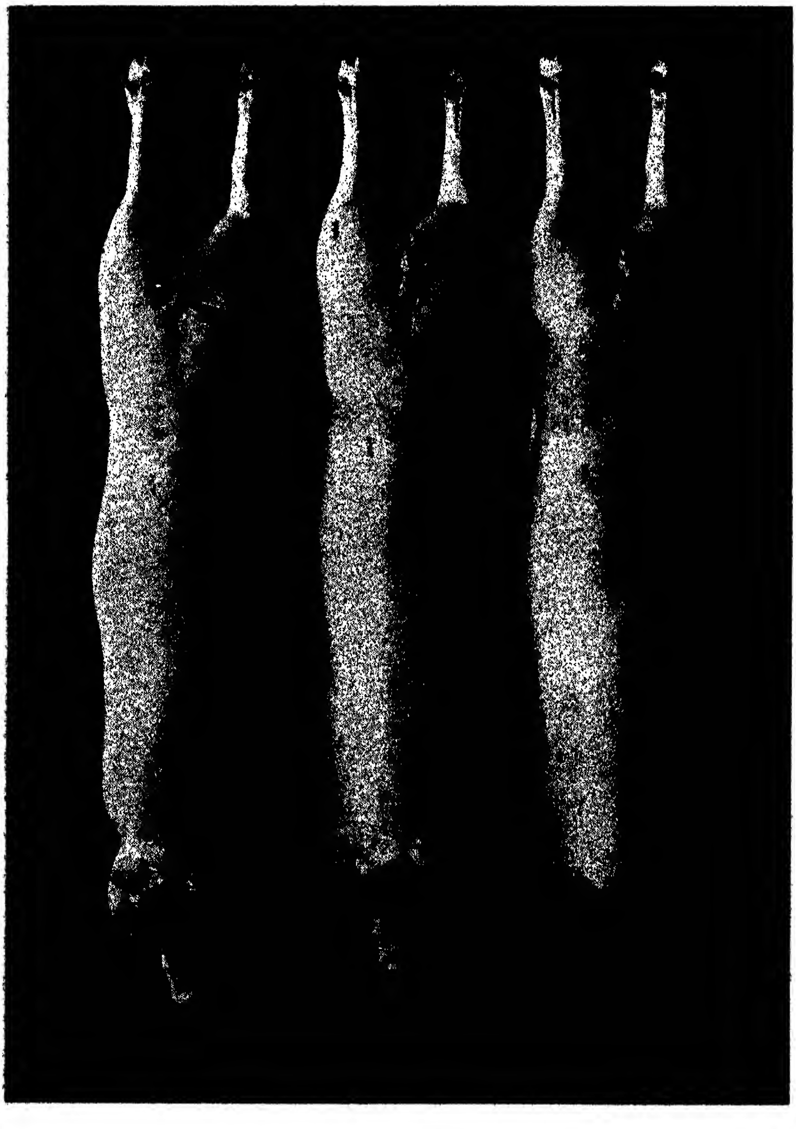


Plate 175.
Catalogue No. 529 (see opposite page).

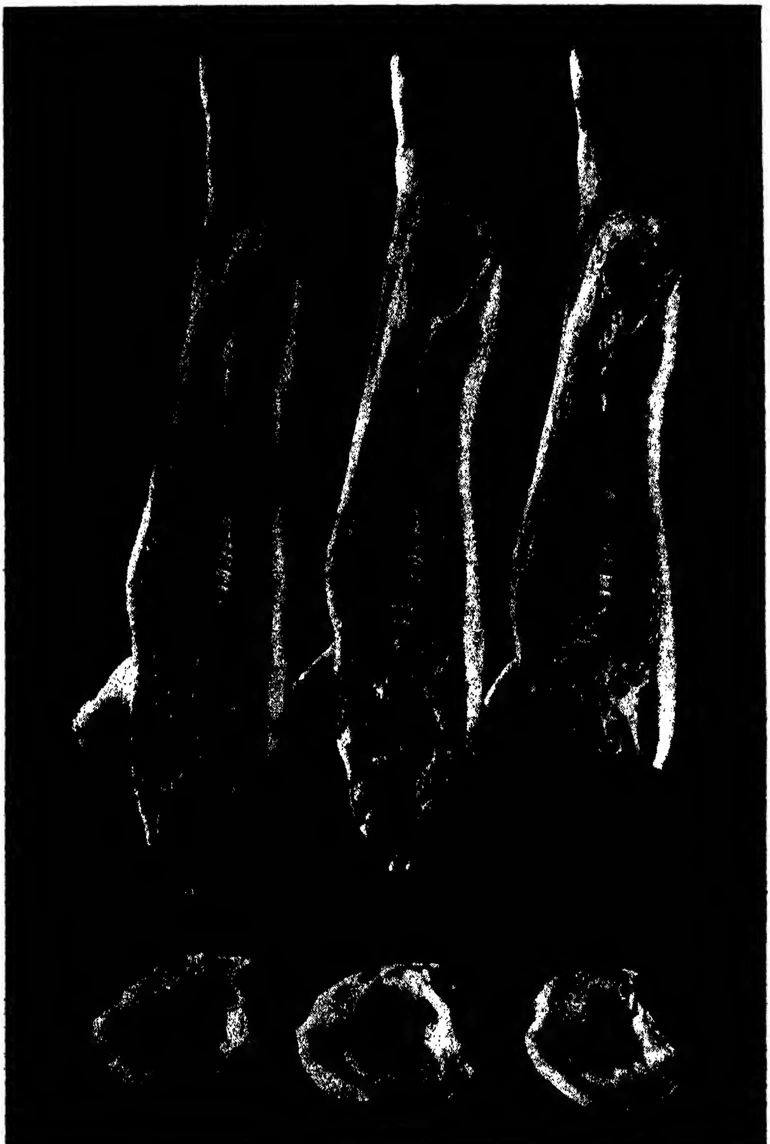


Plate 176.

Catalogue No. 529 were an entry of Berkshire x Tamworth from Mr. H. Thomas, Tabooba. The dressed weights were 138 lb., 138 lb., 131 lb.

These pigs were too fat and very much too short. The carcases were placed 9th.

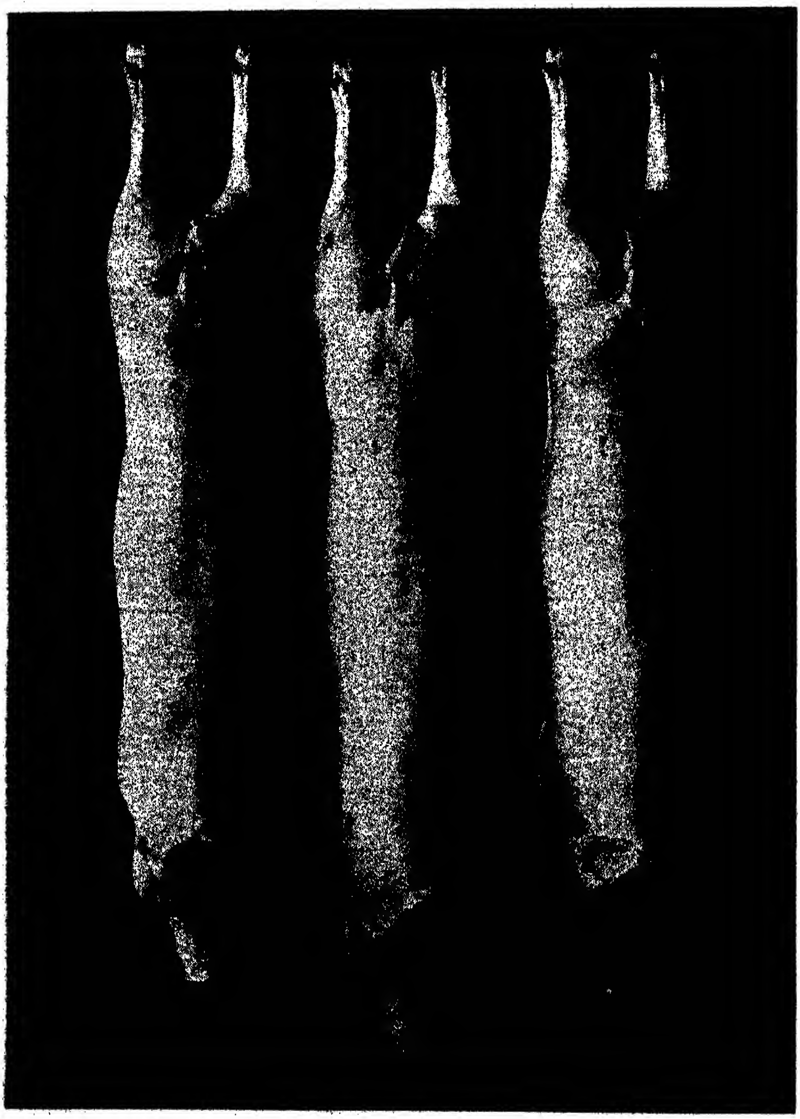


Plate 177.
Catalogue No. 530 (see opposite page).

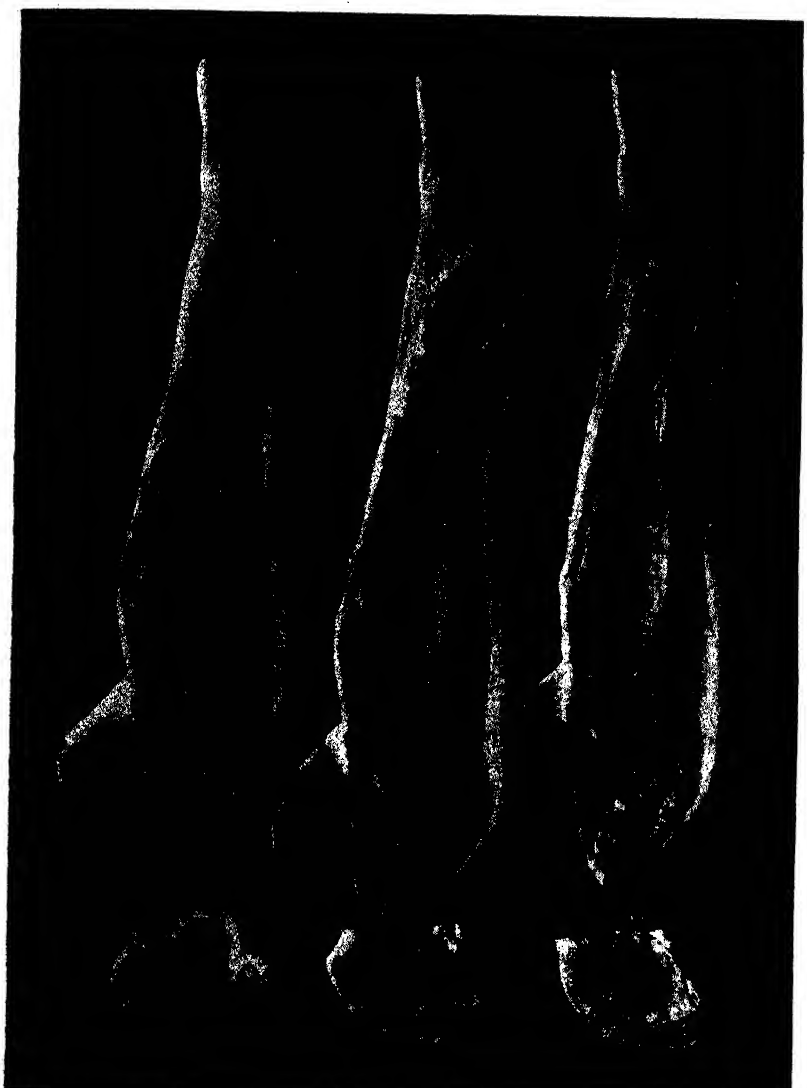
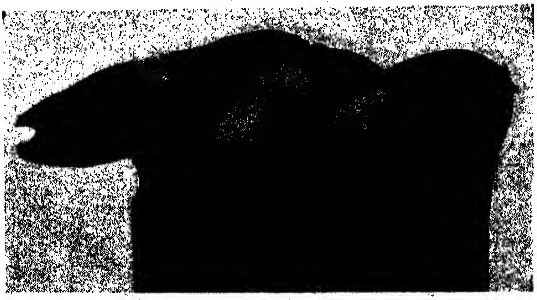


Plate 178.

Catalogue No. 530 were Mr. H. Thomas's entry, described as Large White x Berkshire. They were placed fifth. The carcase weights from left to right are 151 lb., 172 lb., 147 lb.

The 147-lb. pig was much too fat for its weight, and the carcases were all too short.



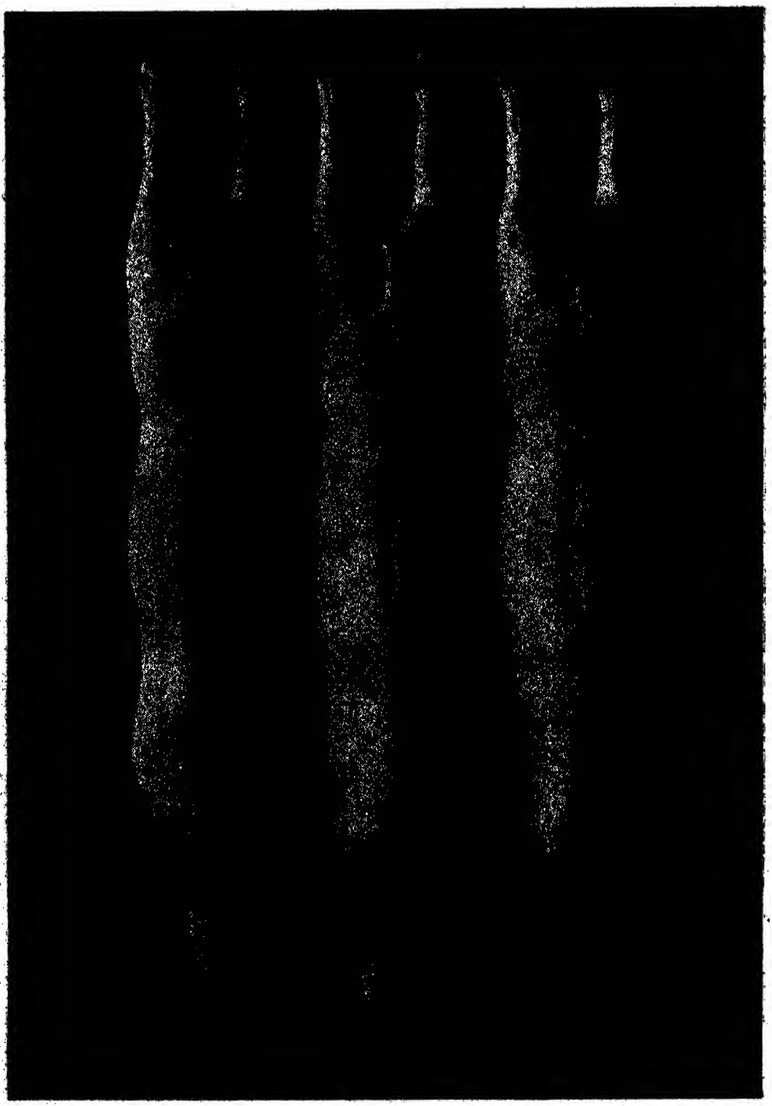


Plate 179.
Catalogue No. 531 (see opposite page).

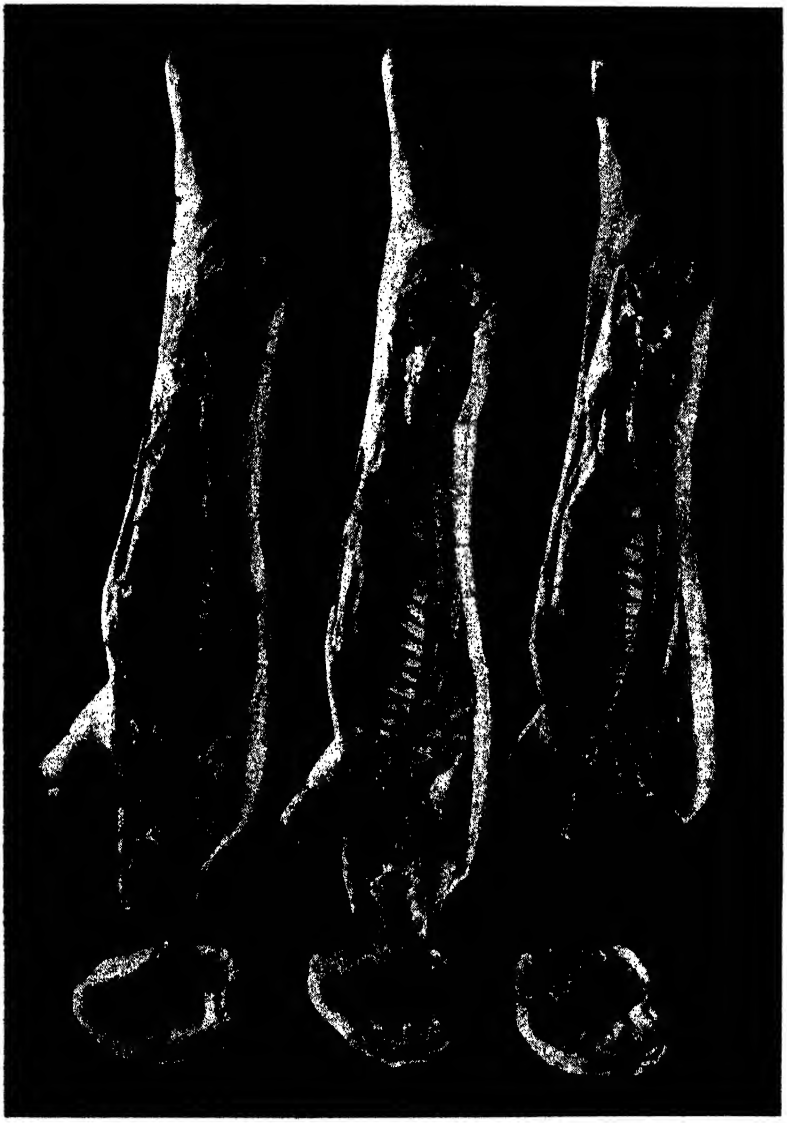


Plate 180.

Catalogue No. 531 were Mr. R. Turpin's entry of Wessex Saddlebacks. These pigs came fourth in the competition.

The carcase weights from left to right are 145 lb., 161 lb., 163 lb.

TABLE I.

—	Maximum Marks.	Catalogue No. 521. Tattoo 521. Carcase Weights on 22-8-38. 129	137	137	Total Per Cent. of Three Pigs.	Catalogue No. 522. Tattoo 052. Carcase Weights on 22-8-38. 159	155	155	Total Per Cent. of Three Pigs.
AWARDS FOR LIVE PIGS.									
Condition	70		68		97·1		69		98·5
Uniformity and type ..	20		18		90·0		19		95·0
General appearance	10		8		80·0		10		100·0
Total	100		94		94·0		98		98·0
AWARDS FOR CARCASES.									
A. By inspection—									
Skin—Smooth and fine..	5	4½	4½	4½	90·0	4	4	4	80·0
Fat—Firm	10	7½	7½	7½	75·0	7	8½	8½	80·0
Hams—Well-filled and fine-boned	8	5	5½	5½	66·6	4	6	5	62·5
Shoulders—Light ..	7	5	5½	4½	71·4	4½	4½	4½	64·2
Streak—Thick, full of lean meat	12	9	7½	9	70·8	5½	7½	10½	65·2
B. By measurement (in mms.)—									
Eye muscle of loin—Thick	28	[44] 19	[47] 22	[42] 17	69·0	[35] 5	[41] 15	[50] 24	52·3
Back-fat thickness—Correct proportion to weight	20	[20] 17	[18] 19	[22] 17	88·3	[24] 17	[24] 17	[20] 19	88·3
Body—Long, in proportion to weight ..	20	[723] 10	[747] 10	[740] 9	48·3	[743] 2	[785] 0	[725] 0	3·3
Leg length—Short, in proportion to weight ..	5	[559] 3	[564] 4	[534] 5	75·0	[610] 0	[570] 5	[576] 4	60·0
Total	115	80	85½	79		49	67½	79½	
Total (three carcases)	345		244½		First 70·86		196		Eighth 56·81
Grand Total (live pigs and carcases)	445		338½		First 76·06		294		Equal Seventh 66·06

NOTE.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the black figures in brackets, *e.g.* [44].

TABLE II.

—	Maximum Marks.	Catalogue No. 523. Tattoo 523. Carcase Weights on 22-8-38. 176	173	171	Total Per Cent. of Three Pigs.	Catalogue No. 524. Tattoo 524. Carcase Weights on 22-8-38. 152	155	147	Total Per Cent. of Three Pigs.
Awards for Live Pigs.									
Condition	70		68½		97·8		69		98·5
Uniformity and type ..	20		18		90·0		18		90·0
General appearance	10		10		100·0		10		100·0
Total	100		96½		96·5		97		97·0
Awards for Carcases.									
A. By inspection—									
Skin—Smooth and fine..	5	4	4	4	80·0	4½	4½	4½	90·0
Fat—Firm	10	9	9	9	90·0	10	9	9½	95·0
Hams—Well-filled and fine-boned	8	6	5½	4	64·5	6	5	6	70·8
Shoulders—Light ..	7	5½	5½	5½	78·5	5	5	5	71·4
Streak—Thick, full of lean meat	12	3½	3	3½	27·7	7	6½	6	54·1
B. By measurement (in mms.)—									
Eye muscle of loin—thick	28	[50] 23	[43] 16	[45] 18	67·8	[44] 18	[47] 21	[40] 14	63·0
Back-fat thickness—Correct proportion to weight	20	[37] 0	[41] 0	[40] 0	0·0	[29] 7	[18] 17	[30] 1	41·6
Body—Long, in proportion to weight ..	20	[743] 0	[760] 0	[772] 1	1·6	[732] 1	[791] 11	[737] 4	26·6
Leg length—Short, in proportion to weight ..	5	[571] 5	[584] 5	[537] 5	100·0	[560] 5	[588] 3	[544] 5	86·6
Total	115	56	48	50		63½	82	55	
Total (three carcases)	345		154		Tenth 44·63		200½		Seventh 58·11
Grand Total (live pigs and carcases) ..	445		250½		Tenth 56·29		297½		Sixth 66·85

Note.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the black figures in brackets, *e.g.* [44].

TABLE III.

—	Maximum Marks.	Catalogue No. 525. Tattoo 525. Carcase Weights on 22-8-38.			Total Per Cent. of Three Pigs.	Catalogue No. 527. Tattoo 527. Carcase Weights on 22-8-38.			Total Per Cen. of Three Pigs.
		168	152	143		142	123	134	
AWARDS FOR LIVE PIGS.									
Condition	70		67		95·7		67½		96·4
Uniformity and type ..	20		17		85·0		19		95·0
General appearance	10		9		90·0		9½		95·0
Total	100		93		93·0		96		96·0
AWARDS FOR CARCASES.									
A. By inspection—									
Skin—Smooth and fine ..	5	4	4	3½	76·6	4	4	4	80·0
Fat—Firm	10	9	9	7½	85·0	8	8½	9	85·0
Hams—Well-filled and fine-boned	8	6	5	5½	68·7	2	3	4	37·5
Shoulders—Light ..	7	4½	5	5	69·0	6½	6½	6½	92·8
Streak—Thick, full of lean meat	12	9½	9½	7	72·2	9	8	10	75·0
B. By measurement (in mms.)—									
Eye muscle of loin—Thick	28	**[44]** 17	**[39]** 13	**[47]** 21	60·7	**[45]** 19	**[36]** 9	**[40]** 15	51·1
Back-fat thickness—Correct proportion to weight	20	**[31]** 4	**[25]** 16	**[10]** 4	40·0	**[16]** 16	**[17]** 20	**[19]** 20	93·3
Body—Long, in proportion to weight ..	20	**[755]** 0	**[770]** 9	**[762]** 11	33·3	**[772]** 13	**[730]** 13	**[765]** 16	70·0
Leg length—Short, in proportion to weight	5	**[572]** 5	**[584]** 3	**[567]** 4	75·0	**[625]** 0	**[565]** 2	**[557]** 4	40·0
Total	115	59	73½	68½		77½	74	88½	
Total (three carcases)	345		201		Sixth 58·26		240		Second 69·56
Grand Total (live pigs and carcases) ..	445		294		Equal Seventh 66·06		336		Second 75·5

NOTE.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the black figures in brackets, *e.g.* **[44]**.

TABLE IV.

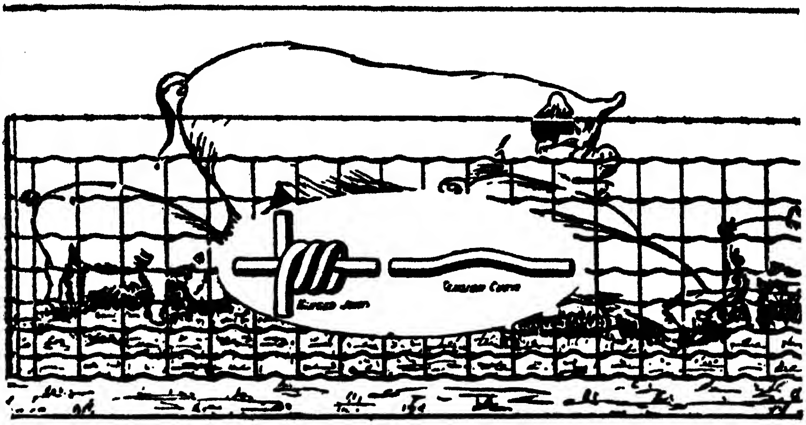
—	Maximum Marks.	Catalogue No. 528. Tattoo 528. Carcase Weights on 22-8-38. 143	151	148	Total Per Cent. of Three Pigs.	Catalogue No. 529. Tattoo 529. Carcase Weights on 22-8-38. 138	131	138	Total Per Cent. of Three Pigs.
AWARDS FOR LIVE PIGS.									
Condition	70		67½		96·4		68		97·1
Uniformity and type ..	20		19		95·0		18		90·0
General appearance	10		9½		95·0		9		90·0
Total	100		96		96·0		95		95·0
AWARDS FOR CARCASES.									
A. By inspection—									
Skin—Smooth and fine	5	4	4	4	80·0	4	4	4	80·0
Fat—Firm	10	8	7	7½	75·0	8	8½	8½	83·3
Hams—Well-filled and fine-boned	8	4½	4	4½	54·1	7	7	8	91·6
Shoulders—Light ..	7	6	6	6	85·7	4	4½	3½	57·1
Streak—Thick, full of lean meat	12	10	9½	9	79·1	6½	6	6	51·3
B. By measurement (in mms.)	—								
Eye muscle of loin—Thick	28	**[40]** 14	**[43]** 17	**[46]** 20	60·7	**[46]** 21	**[38]** 13	**[45]** 20	64.2
Back-fat thickness—Correct proportion to weight	20	**[24]** 16	**[16]** 15	**[21]** 19	83·3	**[26]** 10	**[22]** 17	**[28]** 4	51·6
Body—Long, in proportion to weight ..	20	**[765]** 12	**[790]** 13	**[770]** 11	60·0	**[690]** 0	**[712]** 5	**[688]** 0	8·3
Leg length—Short, in proportion to weight	5	**[583]** 2	**[632]** 0	**[580]** 3	33·3	**[498]** 5	**[525]** 5	**[528]** 5	100·0
Total	115	76½	75½	84		65½	70	59	
Total (three carcases)	345		236		Third 68·4		194½		Ninth 56·38
Grand Total (live pigs and carcases) ..	445		332		Third 74·6		289½		Ninth 65·05

NOTE.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the black figures in brackets, *e.g.* **[44]**.

TABLE V.

—	Maximum Marks.	Catalogue No. 530. Tattoo 530. Carcase Weights on 22-8-38. 147	151	172	Catalogue No. 530. Total Per Cent. of Three Pigs.	Catalogue No. 531. Tattoo 531. Carcase Weights on 22-8-38. 168	145	161	Catalogue No. 531. Total Per Cent. of Three Pigs.
AWARDS FOR LIVE PIGS.									
Condition	70		68½		97·8		70		100·0
Uniformity and type ..	20		18		90·0		19		95·0
General appearance	10		10		100·0		8½		85·0
Total	100		96½		96·5		97½		97·5
AWARDS FOR CARCASES.									
A. By inspection—									
Skin—Smooth and fine ..	5	4½	4	4	83·0	4½	4½	4½	90·0
Fat—Firm	10	8	8	8	80·0	8	8½	8½	85·0
Hams—Well-filled and fine-boned	8	5½	5½	5½	68·7	5	4½	4	56.2
Shoulders—Light ..	7	5½	4	4½	66·6	4	4½	4½	61·9
Streak—Thick, full of lean meat	12	9½	11	7½	77·7	6	6	7½	54·1
B. By measurement (in mms.)—									
Eye muscle of loin—Thick	28	[45] 19	[43] 17	[48] 21	67·8	[45] 18	[48] 22	[45] 18	69·0
Back-fat thickness—Correct proportion to weight	20	[30] 1	[22] 19	[27] 16	60·0	[28] 12	[26] 12	[28] 16	66·6
Body—Long, in proportion to weight ..	20	[745] 6	[752] 5	[813] 10	35·0	[787] 8	[756] 8	[805] 12	46·6
Leg length—Short, in proportion to weight	5	[554] 5	[530] 5	[542] 5	100·0	[578] 5	[538] 5	[585] 4	93·3
Total	115	64	78½	81½		71	75	79	
Total (three carcases)	345		224		Fifth 64·92		225		Fourth 65·18
Grand total (live pigs and carcases) ..	445		320½		Fifth 72·02		322½		Fourth 72·47

NOTE.—Measurements for eye muscle, back-fat thickness, body length, and leg length are in millimetres, indicated by the black figures in brackets, *e.g.* [44].



The Queensland Sugar Industry.

Bureau of Sugar Experiment Stations.*

STATISTICS OF THE 1937 CROP.

The yield of raw sugar in Queensland for the 1937 crop was 763,325 tons of 94 n.t. This was an all-time record, exceeding that of the previous record of 1936 by some 18,677 tons.

The area harvested was 249,683 acres, which represents an increase of 4,531 acres over the area harvested in 1936.

The yield per acre was 20·6 tons of cane and 3·06 tons of sugar. The latter is a record figure, as is also the tons of cane required to make a ton of 94 n.t. sugar—6·73. The average area harvested per planter was 30 acres.

Over 440,000 tons of sugar were exported; this represents about 30,000 tons in excess of the annual Australian export quota. No. 1 pool sugar averaged £17 11s. per ton, while the value of *all* sugar (including excess) was £15 6s. 5d. This is the second lowest average value recorded since 1914. The total value of the crop was £11,686,640—an all-time record.

MOLASSES PRODUCTION.

During 1937, some 20½ million gallons of molasses were disposed of by the raw sugar mills; in view of the growing interest in the utilization of this product for the production of alcohol, the accompanying graph (Plate 181) is presented. It will be observed that the quantity absorbed by distilleries (7 million gallons) is the highest used for this purpose; an increased quantity was employed as manure (3,360,000 gallons), while 3,910,000 gallons were disposed of as stock feed. The amount required by the mills as fuel was 5½ million gallons. The amount run to waste was negligible, being less than 500,000 gallons, or 2½ per cent. of the total production.

ADVISORY BOARD.

The Advisory Board held two meetings during the year. A new Board was constituted in March, and is now composed of Messrs. N. H. Wellard (Mossman) and C. W. Thiele (Bundaberg), representatives of canegrowers; Messrs. J. Smith (Mackay) and A. V. Thorp (Nambour), representatives of millers; with the Government nominees, the Hon. F. W. Bulcock (Minister for Agriculture), as Chairman, and the Director (Dr. H. W. Kerr).

During the year the Board gave close attention to a number of matters affecting the work of the Bureau, and notably in devising plans for the more effective working of this phase of sugar production. Disease control, improvement of the field service, the utilization of by-products, and the work of the Pests Boards, were amongst the subjects discussed and dealt with. The work of the Board has assisted very materially in promoting increased efficiency in the operation of the Bureau.

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* Each year the Director is required to prepare for Parliament a report of the work of the Sugar Experiment Stations, of which this article is a summary.

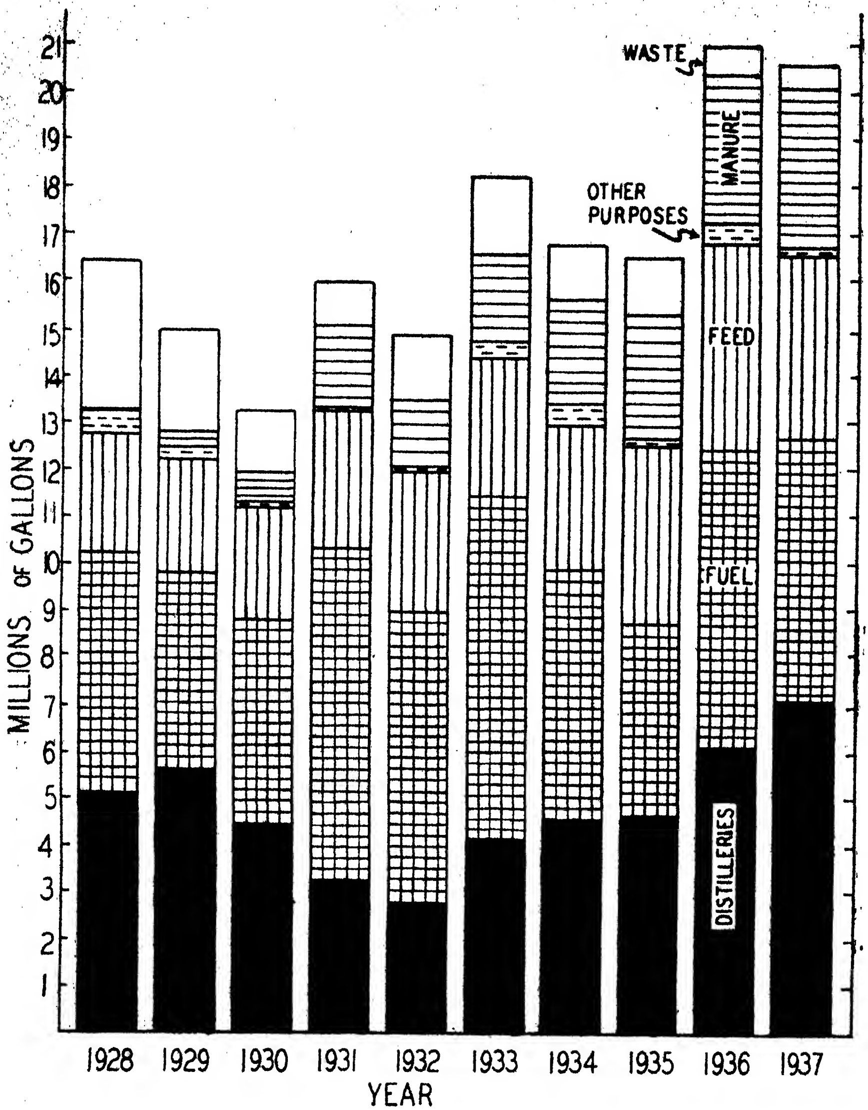


Plate 181.

Illustrating the trends in molasses utilization over the past ten years. The amount now run to waste is insignificant.

SOILS AND AGRICULTURE.

Additional Field Staff.

In order to provide a more effective field service, it was agreed by the Advisory Board that three cadets should be appointed and trained, provided suitable men are offering. It is anticipated that such appointments will be finalised in the near future. Doubtless this action will be warmly welcomed by canegrowers.

Farm Trial Work.

Farm experimental work continues to be a major feature of the extension service. Fertility plots have been continued, while there has been a marked increase in the proportion of farm varietal trials, consequent upon the release of a series of new varieties for trial purposes, in North Queensland.

Soil Surveys.

The agricultural chemists of the Bureau have recently completed an investigation which has been pursued for the past ten years, and which has demonstrated that the laboratory fertility tests on soils agree very closely with field experience with fertilizers. This finding paves the way for systematic soil fertility surveys, leading eventually to a thorough knowledge of the fertilizer needs of every cane field of the State.

The submitting of soil samples by growers, for analysis and fertilizer advice, is increasing in popularity as the value of this advice becomes appreciated; during the year 528 soils were tested in the Brisbane laboratories of the Bureau. This service is provided free of charge to canegrowers.

Experiment Station Field Days.

Annual field days at the Sugar Experiment Stations are well supported by canegrowers. Functions of this nature were held at Bundaberg and Mackay during the past year; in the future, Meringa will also have its field day. The increased standard and greater breadth of the work which it is now possible to carry out at the stations holds much of interest to farmers, and the field day provides an excellent opportunity for the officers of the Bureau to meet growers, and demonstrate their work.

Legume and Fodder Crops.

Considerable work has been done in an attempt to provide for canegrowers, more suitable legumes than are at present available, and fodder grasses which may prove useful for paddocks in which stock are grazed, or which could be harvested for fodder or hay-making purposes. Doubtless canegrowers could save considerable expenditure on horse feed if they would devote closer attention to the production of crops for the purpose: even where the use of a supplementary ration of concentrated protein meal were necessary, the utilization of molasses as a source of energy food would reduce feeding costs very substantially.

Of the legumes under tests, clovers, lespedezas, and soybeans were found to be generally unsuitable, but very encouraging results have been recorded with two species of Crotalaria. Sunn hemp (*C. juncea*) is a vigorous grower, which gave good yields at Meringa and Bundaberg: but it is probably not so suitable as *C. goreensis*, which will be known in future, as Gambia pea. For long fallow purposes it appears to be very useful, and further plantings on the Experiment Stations and on selected farms will be made towards the end of the year.

Of the fodder grasses tested, white panicum, *Panicum coloratum*, and fine-stemmed Guinea grass showed promise, and will be further experimented with; white panicum was specially favoured by stock.

Cultures for Legumes.

The culturing of highly-efficient strains of root nodule bacteria is now being carried out in the Brisbane laboratories, and cane farmers desirous of obtaining cultures with which to inoculate legume seeds prior to planting were invited to apply for them. This service is being keenly availed of, and doubtless benefits will be derived from the practice as has been the case in overseas countries.

Maturity Testing of Cane.

Some years ago the officers of the Bureau were actively associated with the investigation of methods for determining the maturity of cane crops, so that the farmer would be assured of maximum returns for his product. Unfortunately, growers have not responded in a manner which would demonstrate that they fully appreciate the value of such a service. The experiment stations are not able to cope with any systematic campaign of this character, but they are willing to conduct tests for those farmers who submit regular samples taken systematically from their several fields.

EXPERIMENT STATION PLOT TRIALS.

Several interesting trials were harvested during 1937 on the Mackay and Bundaberg Stations. The main features of these experiments are recorded below.

Fertility Trial, Mackay Station.

Although the plant crop yields showed little benefit from the fertilizers applied, the ratoons exhibited unmistakable gains for top dressings of sulphate of ammonia. On all old lands the humus supply is greatly depleted, and almost without exception, substantial crop increases are regularly obtained from the use of this material. The use of the correct fertilizer in adequate amounts is one of the first essentials in the production of successful ratoons under these conditions.

The actual yields for the first ratoon crop of this trial were—

"No manure" plots	11·4 tons per acre
Fully fertilized plots	19·5 tons per acre
Gain from manure ..	8·1 tons per acre

Irrigation and Nitrogen Trial, Bundaberg.

The benefits of irrigation on the red volcanic soils of the Bundaberg area are demonstrated by the results of this trial to date. The plant crop (varieties P.O.J. 2725 and P.O.J. 2878) averaged 58 tons of cane per acre (despite early frost damage), while the first ratoon yield was 42 tons per acre, although the cane received water only in alternate interspaces for the first six months of its growth, and none thereafter.

Despite these heavy crops, no outstanding gains were recorded for sulphate of ammonia, which shows quite clearly that these soils, when moderately and consistently manured, are capable of heavy yields if given the necessary moisture supply.

Of the two varieties, P.O.J. 2725 was much superior to P.O.J. 2878 under these conditions.

The averages were—

Variety.	Plant Crop.	First Ratoons.
	Tons.	Tons.
P.O.J. 2725	**63·0**	**46·6**
P.O.J. 2878	50·5	35·6

Trash Trial, Bundaberg.

An experimental block was selected in 1933, and subdivided into four plots, on two of which all trash and tops were to be conserved and ploughed under, while in the remaining two, all crop residues were to be burned annually.

For the first two cane crops, no benefits from the treatment were detected, but it is of interest to note that in 1937, the plant cane from the trash plots was slightly heavier than that for the "no trash" plots. It will be interesting to observe whether this advantage will be maintained.

This experiment will be continued for a number of years to demonstrate the cumulative effects of the treatment.

Potash Trial, Bundaberg.

It is recognised that crops on the red volcanic loam frequently show response to application of potash, particularly where this plantfood has not been applied consistently. On the other hand, regular applications of even moderate amounts of this material soon eliminate such deficiencies. It was therefore decided to institute a "permanent" potash trial, on some plots of which dressings of different magnitude would be applied, while on others potash would be withheld.

The first plant crop from the trial was seriously affected by the droughty conditions, and no significant effects were recorded for any of the treatments.

Cultivation Trial, Bundaberg.

It has been reported on frequent occasions that cultivation appears to be without influence on crop yield on the red volcanic soil, except in-so-far as it controls weeds. A trial was instituted in 1934, which combined deep grubbing (subsoiling) with surface cultivation. Three crops have now been harvested, and in no instance could any benefits from the several operations be detected. Doubtless old-established opinions in this regard must not be accepted without careful examination, in the light of specific soil types and local conditions.

Varietal Trial, Mackay.

The first series of three finally selected seedlings, raised on the Mackay Station since this project was initiated, have been under yield trial for the past three years. The results for the plant and first ratoon crop are now available:—

YIELDS.—Plant and First Ratoon Crops.

Variety.	Plant Crop.		First Ratoons.	
	Cane per Acre.	C.C.S in Cane.	Cane per Acre.	C.C.S. in Cane.
	Tons.	Per cent.	Tons.	Per cent.
Q. 813	32·0	16·6	30·4	16·6
C. 57	30·6	**17·6**	34·3	**18·4**
C. 83	**40·0**	16·4	**42·7**	16·5
C. 85	32·8	16·8	37·9	16·4

It will be noted that C. 83 has far outyielded Q. 813 in both years, while the C.C.S. was also satisfactory. Unfortunately both C. 83 and C. 85 (which are seedlings of P.O.J. 2878) are too highly susceptible to downy mildew disease to make further plantings desirable. The variety C. 57 (now called **Q. 20**) is at least equal to Q. 813, but shows in addition a particularly high C.C.S. This variety is now in farm propagation plots, and it is anticipated that it may be released for general planting in 1939.

Varietal Trial, Bundaberg.

A varietal trial which included Co. 290, P.O.J. 234, P.O.J. 2725, and P.O.J. 2878 has been in progress at Bundaberg for three years. The plant and first ratoon crops both showed the outstanding value of P.O.J. 2725 in yield and C.C.S. Even during the droughty conditions of 1937, it yielded a ratoon crop of almost 20 tons per acre.

Varietal Trial, Bundaberg.

An experimental block, the results from which should prove of interest to Southern Queensland growers, was harvested as a plant crop in 1937. It contained all the gum-resistant P.O.J. varieties and Co. 290; the year was, however, far from favourable, due to the light rainfall, so that the results mainly reflect drought resistance. The heaviest tonnage was given by P.O.J. 2875 (22 tons per acre), but P.O.J. 2883 and P.O.J. 2878 were very little inferior. Co. 290 suffered severely from the dry conditions. In C.C.S content, P.O.J. 2883 was the best of all the high yielding canes, although it was inferior to P.O.J. 2725. The ratoons from this field, to be harvested this season, should be particularly interesting.

Varietal Trial, with Single *v.* Double Planting, Bundaberg.

In this trial, the varieties were Co. 290 and P.O.J. 2878: plots of "single" and "double" plantings were also provided. There was no great difference between the yields of the two varieties, but P.O.J. 2878 gave the higher C.C.S. The results for double sett planting, as against single setts in the furrow, were a net gain for the former of 3·7 tons of cane per acre, from the plant and first ratoon crops combined. This emphasises the desirability of the practice with canes which are liable to give a poor germination.

Rotational Grazing Block, Mackay Station.

This block of rather inferior soil is some 16 acres in area, and it has been subdivided into eight plots, each of 2 acres. These plots will be worked in an eight-year rotation, as follows:—(1) Plant cane, (2)

first ratoon, (3) grass, (4) grass, (5) grass, (6) grass, (7) grass, (8) grass. The plant cane will be preceded by a green manure crop, while a similar crop will also be planted and ploughed under before seeding to grass after the ratoon crop. In this way an attempt will be made to determine the value of such a programme in restoring the fertility of old soils. All trash and tops will be conserved, also, and returned to the soil.

While the land is in pasture it will be grazed by sheep. A flock of Merino-Corriedale ewes has been purchased, and these are mated with a Romney Marsh ram for the production of cross-bred lambs. The ewes from this mating will be retained for further cross-breeding purposes.

The results of the experiment to date are very interesting. The plant crop from Plot No. 1 yielded 26 tons of cane per acre in 1937: Plot No. 2 was planted in the spring of 1937, and Plot No. 3 in the autumn of 1938. The sheep yielded wool to an average value of 5s. 2d. per head; as there are the equivalent of 37 sheep grazing an 8-acre block throughout the entire year, the carrying capacity of the land can be gauged. The chief pasture crop to date has been *Panicum muticum*.

During the drier months of the year, before and after the lambing season, the ewes were given the following supplementary ration per week:—

1 oz. sterilized bone meal.
12 oz. linseed (*later*, peanut) meal.
32 oz. molasses.

The first wether lambs to be slaughtered were found to be of good quality, and it may be concluded that the experiment has established the possibilities of fat lamb raising on this area of the tropical coast.

CANE BREEDING.

General Methods.

The germination, propagation and testing of new cane seedling varieties is carried out at the three field stations of the Bureau, viz.—Meringa, Mackay, and Bundaberg. As the cane flower sets seed only within the wet tropical belt of Queensland, all cross-pollination has to be carried out at the northern station; the ripened seed is then sent to Mackay and Bundaberg in sealed containers for germination. These three stations represent the wet tropical, dry tropical, and sub-tropical regions of the Queensland sugar belt, and crosses are planned accordingly and the selection of seedlings is made under each set of conditions. It is obvious that it would be useless trying to raise all seedlings at Meringa and to try and select canes for Bundaberg under these conditions. On the other hand any promising seedlings raised at any one station are sent to Brisbane, grown in quarantine, and then sent to the other districts for field testing. Consequently the results obtained at any one station are eventually made available to all districts.

Our present programme provides for the raising of about 10,000 seedlings per annum at Meringa and 5,000-6,000 at Mackay and Bundaberg. A certain number of crosses are always made with the object of providing canes for the selection of parents for future crossing, and these are made at Meringa. The particular crosses forwarded to

each Station depend on the requirements of the district and the known behaviour of the progeny of a particular cross. For example, it is known that P.O.J. 2878 when used as a parent confers high resistance to gumming disease on a very high proportion of its progeny; P.O.J. 2878 is therefore used to a considerable extent in the crosses intended for Southern Queensland.

Trends in Selection.

The outstanding requirements of new canes in the northern and central districts at the present time are varieties which will have stronger rooting systems which will enable them to resist grub attack better, and harder rinds which will give greater resistance to borer attack. As a result of these requirements we are compelled to work towards a somewhat increased fibre content of cane. It is likely therefore that the canes of the future will have a somewhat higher fibre than the canes they replace.

Early maturity is continually sought, but is a most difficult character to couple with reasonable vigour. We have obtained some cane-sorghum hybrids, and are experimenting in the hope of developing early maturing varieties from these. Disease resistance trials are continuously carried out, and very many seedlings are discarded on account of their failure to possess a sufficiently high standard of disease resistance.

1938 Cross Pollination Season.

It is unusual to have two very bad arrowing years in succession, but the extraordinarily dry autumn and early winter conditions of the past two years greatly depressed arrowing in the Cairns district. This year, owing to little or no arrowing in such varieties as Oramboo, Korpi, 1900 Seedling, Q. 813, E.K. 28, S.C. 12/4, D. 1135, P.O.J. 2878 and Badila, we were unable to make many of the matings which were planned. Nevertheless over sixty different crosses were completed and have provided seed from a wide and interesting range of parent canes. A considerable amount of this seed is the product of cane × ½ sorghum crosses, and the resultant seedlings should therefore contain one-fourth sorghum "blood." As may be imagined their growth will be watched with great interest. We also succeeded in obtaining a good lot of seed from crosses with P.O.J. 213; this variety is often very difficult to cross, but its high Fiji disease resistance makes it attractive for trial.

"Original" and "Selected" Seedlings.

Every seedling produced is a new and distinct variety, so that when we speak of raising 20,000 seedlings we actually mean the production of 20,000 new varieties. Although the seedlings produced from any one cross may often be very similar in type the chances of any two being identical are but one in many millions.

A stool of cane which is produced from the germination of a tiny seed is known as an *original* seedling. When these stools are about a year old they are carefully inspected, and the most promising are selected for further planting—the rest are rejected and milled. Those seedlings which are retained for further trial are known as *selected* seedlings. The practice in Queensland is to grow the seedlings on the stations for about 4-5 years—testing, re-selecting, and discarding—before the final selections are sent out for farm trial.

Varieties Under Trial at Experiment Stations.

There are, of course, many hundreds of selected seedlings under trial at the three stations where they are tested for vigour, type of growth, germination, coverage, sugar content, time of maturity, ratooning, fibre content, hardness of rind, resistance to disease, and so on. However, these varieties do not hold much direct interest for the cane farmer, whose chief concern is naturally with those survivors which ultimately go out on to the farms for field trial.

The most interesting seedling from last year's batch is one obtained from crossing a cane-sorghum hybrid (Co. 515) with P.O.J. 2940. The small planting of this newly-introduced hybrid gave rise to a couple of arrows very early in the season, and the only material available for crossing with it was an early arrow of P.O.J. 2940. One lone seedling resulted from the cross, but it has proved quite vigorous, and is, we hope, a sample of what might be expected from this cross in the future; as noted elsewhere we have this year a fairly large quantity of seed from this cane-sorghum hybrid crossed back on to cane of several varieties.

Q. Seedlings.

Seedlings which go out into farm trials are given a "Q" number to distinguish them permanently. Since the adoption of this system of naming, four years ago, some twenty-seven of the Q. series have been set out in farm trials. One, Q. 2, has been approved for commercial planting, some have been discarded, two will probably be approved for planting next year, while others are still in the early stages of farm testing. For the information of farmers we append a brief note on such of these twenty-seven canes as are being propagated for commercial planting or are still under field trial.

Q. 2.

This variety was approved for commercial planting in the northern district in 1937, and a considerable tonnage will be harvested this year. This is not a general purpose cane, but should prove useful in special locations; it has a very erect habit, is free-trashing, and has high resistance to top rot, borer attack, and good resistance to flood damage, is a latish maturer with medium to good sugar content, and produces a good plant crop under conditions of adequate moisture. On the other hand it does not do well under dry conditions, is a slow ratooner, and should not be harvested before about mid-September.

Propagation plots of this variety have been established in Mackay and the Lower Burdekin, where it will be fully tested; it is too susceptible to gumming disease to be considered, at present, in the southern districts.

Q. 4 and Q. 12.

Q. 4 and Q. 12 were planted in a number of farm yield trials in North Queensland, but will be discarded on account of low sugar, brittle nature, and lodging under farm conditions in the case of Q. 4, and unsatisfactory stooling and sprawling habit in the case of Q. 12. The yield of cane in both instances was fairly good, but both are definitely inferior to Q. 10.

Q. 10.

Q. 10 has performed well during the past season when grown in competition with S.J. 4 and Clark's Seedling, and we hope that this variety, being resistant to gumming, will serve as a satisfactory substitute for S.J. 4 and Clark's Seedling in the Mulgrave area. Sugar content is good, and to date, strike and ratooning have been satisfactory. Propagation plots have been established in each of the northern mill areas, and the variety is at present growing in quarantine in Brisbane preparatory to transfer to other districts for trial.

Q. 10 is faily resistant to gumming and leaf-scald, and in the northern areas, is considerably more resistant to top rot and borer damage than is Badila.

Q. 13 and Q. 19.

These two varieties have been set out in farm yield trials in the northern areas this year, but little is known of their performance to date. Q. 13 has an excellent sugar content and appears to germinate well, but, unfortunately, recent indications are that it ratoons weakly.

Q. 21, Q. 26 and Q. 27.

These three vigorous canes have been planted in farm observation trials, and will be advanced to farm yield trials in 1939 if they continue to show promise. Maturity tests now being carried out indicate that they are rather low in sugar, and they may have to be discarded on this account.

Q. 20.

Q. 20 was bred at the Mackay Experiment Station, and some twenty-five propagation plots will have been set out on farms in the central district by the time this report appears in print. It is a medium cropper, giving a plant crop of similar tonnage to Q. 813, but ratoons considerably better than this variety; sugar content has been consistently high and maturity early to mid-season. A propagation plot of this variety has also been established in the Lower Burdekin district, and supplies will be transferred to the northern and southern areas next year.

Q. 22, Q. 23, Q. 24, Q. 25.

Of four seedlings tested at Bundaberg during the past season Q. 25 appears definitely the best yielding variety. Unfortunately it has exhibited susceptibility to Fiji disease and, in view of the Fiji and downy mildew disease situation in Southern Queensland, its further propagation has been postponed pending confirmatory disease resistance trials.

Varietal Statistics.

In Table I. are set out the percentages of the varieties crushed in each of the four major districts during the four years 1934-1937. It will be of interest to review this table again in three or four years time, when some of the new Q. series seedlings will have had time to become established, should they prove suitable to local conditions. It will be seen that over the four-year period the greatest changes have taken place in the southern district where the gumming disease resistant canes, P.O.J. 2878, P.O.J. 213, and Co. 290, are rapidly replacing

Q. 813 and Uba and the susceptible 1900 Seedling, D. 1135 and Black Innes. The rise of the thin Indian cane Co. 290 has been especially rapid, increasing from less than 1 per cent. in 1935 to 15 per cent. in 1937; this variety may be grown to some extent in the Mackay district, but trials have shown that it is definitely unsuitable for more northern districts.

TABLE I.—DISTRICT CANE VARIETY CENSUS, 1934-37.

Varieties which have constituted one per cent., or more, of District Crops, Grouped according to Country of Origin. Returns recorded to the nearest one per cent.

District	North of Townsville.				Burdekin and Giru.				Central.				Southern.			
Variety.	1934.	1935.	1936.	1937.	1934.	1935.	1936.	1937.	1934.	1935.	1936.	1937.	1934.	1935.	1936.	1937.
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Badila (N.G. 15) ..	65	61	60	59	38	49	51	55	16	15	12	13	..	1	..	1
Korpi	1	..	..	1	5	5	6	6	..	..	..	..	1	1	1	2
Oramboo	..	..	..	..	1	1	1	..	..	..	1	1	3	4	4	4
Mahona (N.G. 22) ..	..	..	..	..	..	..	..	..	..	..	..	..	3	2	1	..
N.G. 16	..	..	..	..	..	..	..	..	..	..	..	..	1	1	1	1
Clark's Seedling (H.Q. 426)	7	7	8	8	13	9	9	8	11	10	9	9	..	..	..	..
H.Q. 409	12	14	12	13	..	..	..	..	..	..	..	..	..	..	..	..
H.Q. 285	..	..	..	..	..	..	..	..	2	1	1	1	5	4	3	3
Q. 813	3	2	3	2	..	..	..	..	12	11	9	8	10	10	8	6
Q. 1098	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2	1
S.J. 4	3	7	8	7	..	..	1	2	..	..	..	..	..	..	..	..
S.J. 2	..	..	..	..	..	..	..	1	..	..	1	2	..	..	..	..
P.O.J. 2878	1	1	1	2	..	..	..	..	..	..	2	2	5	10	17	22
P.O.J. 2714	..	..	..	..	1	..	..	1	7	8	6	5	4	5	4	3
P.O.J. 213	..	..	..	..	..	..	..	..	2	2	2	1	8	11	17	15
P.O.J. 234	..	..	..	..	..	..	..	..	..	..	..	..	1	1	3	4
E.K. 28	..	..	..	..	23	18	23	22	12	11	11	12	..	..	..	..
M. 1900 Seedling ..	..	..	..	..	..	..	..	..	33	38	46	45	13	11	9	6
Black Innes (M. 189)	1	..	1	..	..	..	..	..	1	1	..	..	7	4	2	1
D. 1135	4	4	3	2	..	..	..	..	1	1	..	..	22	18	12	8
B. 208	..	..	..	..	15	13	8	5	..	..	..	..	..	..	..	..
Uba	..	..	..	..	..	..	..	..	..	..	..	..	7	9	5	4
Co. 210 and 213 ..	..	..	..	..	..	..	..	..	..	..	..	..	5	5	3	2
Co. 290	..	..	..	..	..	..	..	..	..	..	..	1	..	..	5	15
Pompey (7R. 428) ..	2	2	2	3	..	..	..	..	..	..	..	..	..	..	..	..

Origin of Varieties.

Most canegrowers will doubtless be interested to know the composition of the Queensland cane crop according to the country of origin of the varieties concerned, and we have accordingly worked out the following table for the 1937 crop:—

	Per cent.
New Guinea	43·5
Queensland	23·0
Java	14·5
Mauritius	11·0
West Indies	3·5
India	3·0
Fiji	1·5

It is satisfactory to note that approximately one-fourth of the crop is produced from seedling canes raised in this country, and that these seedlings, together with varieties obtained from New Guinea by Australian expeditions, constitute two-thirds of the crop.

Storage of Cane Seed.

Sugar cane produces a very delicate little seed which soon loses its power to germinate when stored in moist air or at ordinary temperatures. This season we constructed an electrically-heated drying-box which rapidly and efficiently dries the "fuzz," which can then be transferred to sealed containers; a little calcium chloride is placed in the containers to absorb any traces of free moisture which may be left. Experiments carried out with the assistance of the North Australian Brewery showed that the germination of such dried fuzz was very greatly improved if it was stored in a chilling room. Under these conditions samples of fuzz were stored for a period of ten months and then germinated as well as the day they were stored.

CANE DISEASES.

Gumming Disease in Cane.

Gumming disease has become still more difficult to find in Southern Queensland, due to the rapid elimination of the old susceptible varieties and their replacement with the resistant varieties P.O.J. 2878, P.O.J. 213, Co. 290, and to a less extent, P.O.J. 234. It is expected that in about two years the disease will be virtually extinct in the Bundaberg-Isis district. In fact the only district where this disease is now causing appreciable losses is the Mulgrave area. Here the disease has continued to spread into the highly susceptible S.J. 4 and Clark's Seedling, and for the protection of adjoining districts it has been necessary to declare the whole Mulgrave area a quarantine area and to prohibit the growth of S.J. 4 or Clark's Seedling therein. As soon as these two varieties have been eliminated it is expected that Q. 2 may be grown with safety throughout the area, but its growth would be unsafe in the poorly drained areas so long as it might be exposed to heavily infected crops of S.J. 4 and Clark's Seedling. The new seedling Q. 10 is gumming disease resistant, and has performed well this year in competition with S.J. 4 and Clark's Seedling. Several other resistant seedlings raised by the Bureau and also some raised by the C.S.R. Company are now in yield trials in the gumming area.

Gumming Disease in Other Plants.

During the past three years we have conducted an investigation into the possibility of gumming disease being carried over in plants other than sugar cane. If other plants can carry the disease then it follows that it would be unwise to release any highly susceptible varieties for

planting on an area where gumming disease has been present at one time or another. Upon inoculation the following plants were found to contract gumming disease:—A number of maize varieties including those most widely grown in Queensland, sweet and grain sorghums, Sudan grass, Guinea grass, bastard sorghum, Para grass, Elephant grass, and Johnson grass. Some of the sorghums, in particular, proved highly susceptible and oozed gum as freely as susceptible cane varieties. It seems likely then, that we have growing in and around our cane-fields a number of plants which can contract gumming disease, and our future policy must be influenced by this finding. It is of interest to note that in some of the above listed plants the symptoms of gumming disease are quite unlike those in cane.

Fiji Disease and P.O.J. Varieties.

As is well known by most canegrowers the higher numbered P.O.J. canes (P.O.J. 2714, 2725, 2875, 2878, 2883, 2940, &c.) all contain a certain amount of wild cane in their ancestry. This wild "blood" gives these canes their vigorous growth, strong rooting systems, strong ratooning and resistance to mosaic and gumming diseases. At the same time however, it confers high susceptibility to Fiji disease in the case of all the varieties mentioned; there is not much to choose between them and the only commercial variety which exhibits greater susceptibility is Uba.

Increased susceptibility to such insect-borne diseases expresses itself in an interesting way. Whereas a stool of a resistant variety may require to be fed upon by, say, eight or ten infective insects before it will contract the disease, susceptible varieties may require only one insect per stool. When these insects are blown out of a diseased field by a high wind it is obvious that many stools will receive one hopper whereas very few would receive, say, five or six. Herein lies the danger of a susceptible variety in that it can become diseased when fed upon by a single infective insect.

Fiji disease constitutes a very grave threat to the continued growth of P.O.J. 2725 and 2878; the seriousness of the situation cannot be over-emphasised and we cannot urge too strongly that *now* is the time to take action to save these varieties.

Fiji Disease in the Bundaberg-Isis District.

A small amount of Fiji disease has been present in the Bundaberg-Isis district for a number of years and had persisted on irrigated lands particularly. Several small outbreaks were found by Bureau officers and cleaned up and little damage was caused in the old varieties. With the planting up of P.O.J. 2878 however, the picture begins to tell a different story. The disease spreads into this very susceptible variety with great readiness and strenuous efforts will be necessary if this remarkable cane is to be saved for cultivation. During the year new outbreaks were discovered on the Woongarra, Paddy's Island and the Elliott, and as far as is known the disease is now present on three plantations and about thirty-five farms in Bundaberg and about twenty farms in the Isis.

In an effort to clean up this disease a number of disease eradication orders are being issued and it is hoped that there will be no trouble in enforcing these since the steps taken are all for the common good. The District Executives have also earnestly co-operated by employing gangs to inspect cane and dig out diseased stools.

1938 Season has Favoured Spread of Downy Mildew and Fiji Diseases.

Although caused by widely different agents and spread in entirely different ways downy mildew and Fiji diseases have a good deal in common. Actually Fiji disease is caused by a virus which is spread from plant to plant by the sugar-cane leaf hopper while downy mildew is caused by a fungus, the spores or "seeds" of which blow from plant to plant. On the other hand both are spread mainly during the warm moist months of summer and early autumn; both spread very little during the normal dry months of winter and early spring; and the symptoms of both may remain invisible for long periods after infection.

The long protracted late rainy season coupled with the late and mild winter in the Southern areas provided conditions which were favourable to the spread of both these diseases for an unusually long period. Indeed many cane crops carried very heavy leaf hopper infestation all through the winter in locations where normally it would have been very hard to find any hoppers at all at the end of June. Owing to the masking of symptoms of both diseases for long periods late infection may not show up until about November, but we may be certain that a very much greater amount of spread will have taken place than would have occurred during the late autumn and winter of a normal year.

Downy Mildew Disease.

Like Fiji disease downy mildew owes its chief importance to the fact that the leading P.O.J. canes P.O.J. 2878, P.O.J. 2714 and, in this instance, P.O.J. 213, are highly susceptible. Downy mildew is caused by a fungus and is spread from plant to plant by wind-borne spores of the fungus; thus it can spread considerable distances at a comparatively rapid rate.

Of the old varieties B. 208 was the most susceptible and as a result of its heavy infestation with downy mildew it has been necessary to disapprove its cultivátion in the Lower Burdekin area for the purpose of protecting other varieties like E.K. 28.

The disease has now made its appearance in P.O.J. 2878 in the Mackay district and, to a less extent in the Bundaberg district. Since P.O.J. 2878 is only a minor variety in the Mackay district its further growth has been disapproved as it is feared that it would become a menace to other varieties. In Bundaberg, however, the infestation is lighter and, in addition, P.O.J. 2878 is now the major variety; accordingly every effort is being made to save the variety and a number of plough-out and disease eradication orders have been issued to farmers who have the disease on their properties.

Dwarf Disease.

The mysterious dwarf disease still continues to be found to a slight extent in the lower lying fields of the Rosella district of Mackay. As far as is know this is the only part of the world where this disease occurs and its origin, cause, and the manner in which it is spread remain a mystery. It is, however, a very destructive disease and Mackay farmers should be careful to see that they on no occasion obtain plants from this part of the district. The disease has occurred chiefly in the varieties P.O.J. 2714 (particularly), Malagache and Clark's Seedling, but the first two have now almost disappeared from this section of the district.

Recent plantings have included Co. 290, E.K. 28 and P.O.J. 2878, but our observations indicate the susceptibility of both E.K. 28 and P.O.J. 2878. P.O.J. 2878 in particular seems susceptible under these conditions and, even if it were not disapproved as a result of downy mildew disease, its further growth would be undesirable.

Rind Disease.

Rind disease is one of the oldest known diseases of sugar-cane; its name is really misleading since the formation of pustules on the rind is one of the final stages of the disease. Prior to the appearance of these pustules on the rind it causes a sour reddish rot of the flesh of the stem and appears very similar to red rot disease. Generally it attacks cane some 6-8 joints above the ground and extends upwards for a few joints; thus the mid-part of the stalk may be rotted and dead while the top and butt appear sound. This disease was very prevalent last year in S.J. 4 in the Cairns area, 1900 Seedling at Mackay and standover P.O.J. 2878 in Bundaberg. Considerable losses resulted from the dead cane and reduced C.C.S. content.

The condition responsible for the widespread occurrence of the disease was the unusually dry autumn and winter causing over-maturity of the cane. The control of the disease lies in preventing over-maturity or false maturity and this may be done in part by change of variety, late planting, late applications of nitrogenous fertilizer or irrigation.

Autumn and winter weather conditions in the Cairns-Mossman district have been such as to lead us to expect a recurrence of the trouble this year in S.J. 4 but it is not expected that rind disease will again be prevalent at Mackay and Bundaberg.

Introduction of Varieties from Overseas.

The following varieties have recently been imported from overseas:—

31-1389 is an Hawaiian seedling, bred from P.O.J. 2878; it is reputed to be a rapid grower in the early stages, drought resistant, average sugar content and has a fairly hard rind.

B. 726, a Barbados seedling, which has shown considerable promise as an early-maturing cane in the better rainfall areas.

B. 2933, also from Barbados, is a mid to late season maturing cane suited to the lower rainfall districts of the island.

In addition, we have made arrangements to receive from the C.S.R. Company the following seedlings raised in the Northern Rivers of New South Wales, viz., 30 S.N. 225, 451, 673, and 874, 33 S.N. 1160 and 30 G. 1759. These varieties are nearly all resistant to Fiji and gumming diseases and thus they may be of special use in the southern districts although, of course, they will be tried in all districts.

CANE PESTS.

Northern Cane Grub—Damage in 1938 Season.

Infestations by the northern cane grub, the grub of the "greyback" beetle, were not particularly heavy this year. In the Cairns area the pest has not yet recovered from the severe set-back it received during the heat waves of 1934 and 1935; reduced infestation also occurred throughout the Johnstone district generally, where there was only one

flight of beetles. Weather conditions favoured a big beetle flight in the Invicta area and the Lower Burdekin district, but dry conditions followed the hatching out of the young grubs, causing heavy mortality and, as a result, heavy grub infestations survived only in those fields which were subsequently irrigated.

On the other hand, owing to the short rainy season, the dry conditions intensified the damage done by the smaller number of grubs present and in a number of cases it was later found necessary to fumigate fields where the number of grubs per stool would not normally warrant fumigation. Consequently the area fumigated from Tully northwards (517 acres) was about the same as that fumigated last year.

In the Mackay area the amount of damage caused by this pest promises to be very much less than last year, when some 40,000 tons of grub damaged cane was delivered to the mills.

Long Flights of Greyback Beetles from Feeding Trees.

At times we find heavy infestations of cane grubs in fields although during the previous beetle flight period it was almost impossible to find a single beetle in the neighbourhood of such fields. Such a state of affairs existed this year at Greenhill Plantation when scarcely a beetle was observed on the feeding trees growing on or near the plantation. A search on the hills 1 to 1½ miles away revealed fair numbers on forest trees and these beetles were evidently responsible for the grub infestation which occurred at Greenhill. Such beetles would not have been touched by any beetle collecting campaign.

Fumigation in the Lower Burdekin District.

Following the relatively heavy losses from grub damage which occurred in the Lower Burdekin in 1937 the Pest Boards in that area decided upon a fumigation campaign for 1938. The Boards provided farmers with injectors free of charge and fumigant at reduced cost and also made available the services of temporary supervisors. As this was the first year in which fumigation had been undertaken the Bureau made available the services of Messrs. Buzacott and Knust in order that the supervisors might be instructed in methods of surveying grub infestations and conducting fumigation campaigns. A number of fields in the Kalamia and Inkerman areas were successfully fumigated. Naturally some small mistakes occurred, such as fumigation when the soil was too dry, but with the experience gained from this year's operations the Boards and farmers concerned should be in a position to take care of infestations in future years.

Control of Wireworms.

Wireworm damage to sugar-cane in Queensland is caused mainly by the lowland wireworm which, in turn, is a pest of appreciable importance only in the Mackay and Proserpine areas. It is quite the most important pest of cane in the Mackay area. This worm has a number of moults before it finally attains the beetle stage; in the early moults it is very sensitive to drying out and requires a water-logged soil in order to survive; later on it can withstand extremely dry conditions. The only satisfactory method of control is to have fields well drained before the commencement of the rainy season so that soils do not become water-logged and the young wireworms do not survive in

large numbers. If suitable drainage is not provided then, if wireworms are present, it is very inadvisable to plant susceptible fields until the wireworms have ceased their activities—that is about late September. Many farmers object to such late planting, and it is freely admitted that it has many disadvantages; it must be emphasised, however, that in wireworm years many early plantings actually do become late plantings because of continued replanting and supplying and, in the course of events, are much more expensive and no more satisfactory than a single late planting.

Forecasting Wireworm Infestations.

It has been pointed out on innumerable occasions that the survival of wireworms in the field depends on the extent of the water-logging of the soil around February-March, when the young worms are particularly sensitive to drying out. It follows, therefore, that the liability to wireworm damage is greatly dependent upon the length and intensity of the wet season. On the basis of a number of years of observation it is now possible for the Entomologist at the Mackay Station to forecast the probable intensity of damage, and farmers who have not provided adequate drainage may thus be guided in the making of a decision regarding late or early planting of susceptible fields. Following the heavy rainy season of 1937, warnings were issued in June of that year that damage would be extensive in undrained fields unless plantings were delayed until late September. This forecast proved quite correct, as did that of the previous year. The 1938 rainfall records indicated that relief could be expected and in the Quarterly Bulletin for 1st July, it was anticipated that in early planting damage would be confined to very low lying areas.

Trial Sett Plantings as an Indication of Probable Wireworm Damage.

The wireworm pest in the Mackay district is sufficiently important to warrant continuous attention on those farms where previous experience has indicated that damage by this pest is a possibility. In such places the best possible drainage should be provided prior to the commencement of the rainy season, but this may be supplemented by the planting of trial setts. Commencing early in the season such setts are planted at intervals in the field and later dug up and the eyes examined. The percentage of damaged eyes and shoots, taken in conjunction with the Bureau's forecast, may be used to determine whether earlier planting of that particular block may reasonably be undertaken.

The Rat Pest of Sugar Cane.

Damage to crops in Queensland canefields by rats has now returned to normal proportions in contrast to the great damage caused during the plagues of a few years ago. A special investigation of the habits of the various types of rat which attack cane in Queensland is now being undertaken by the Bureau; amongst other things the investigation is directed towards trying to ascertain the conditions under which these plagues occur and whether they may be forecast. During the course of the period April, 1937, to December, 1937, some 2,333 rats were trapped in the course of rat population studies and for the purpose of obtaining rats for the study of the effects of various poisons, &c. For

this purpose a special live trap was designed and has proved very effective; the chief feature of this live trap is a false floor against which the trigger is set, the weight of the rat being responsible for the release of the trigger and trap door.

Rat Baits.

The attractiveness of baits to rats depends a great deal on the food which forms the base of the bait. Of the foods tested rolled oats proved much more acceptable to the field rats than any others; the order of preference by the rats was: (1) Rolled oats, (2) cracked corn, (3) whole corn, (4) wheatmeal, (5) whole wheat, (6) barley, and (7) bread. There is not much difference between the attractiveness of cracked corn, whole corn, wheatmeal and whole wheat, but barley is not very much desired by the field rat and there is always a poor take of bread. Consequently if bread is used as a food base in a bait it should only be used with a highly effective poison such as phosphorus. No advantage was gained by adding linseed oil to baits; this oil attracts rats, and is excellent for attracting them to traps, but it is not an appetiser and will not improve the take of an unattractive bait.

Poisons Used in Rat Baits.

A large number of rats was caught and caged for the purpose of determining the comparative effectiveness of the poisons commonly used in rat baits. The following poisons were investigated:—Thallous sulphate (thallium), yellow phosphorus, strychnine alkaloid, strychnine hydrochloride, zinc phosphide, red squills, white arsenic, and barium carbonate. With the exception of the first three all must be condemned as being quite unsuitable for use in the poisoning campaigns as conducted in Queensland canefields. Of these three, phosphorus is the most poisonous and thallium least. Since a comparatively large dose of thallium is required to kill a rat it should be used only in conjunction with an attractive food base; it is considered that under present methods of distribution in Queensland the most economical bait strength is 1 part of thallium to 300 parts of food base. On the other hand phosphorus, being very highly poisonous, may be used on an unattractive bait base like bread since so very little needs to be eaten to kill a rat.

Comparing Different Rat Baits.

The tests described above were carried out in cages or in fields where the number of rats present was accurately known. The effects of the poisons were judged, therefore, not by the amount of bait taken, but by the immeasurably better test of the number of rats killed. This is a very important point and, in fact, the amount of bait taken in the fields is a very unreliable guide to its effectiveness. For example, it has been shown that there may be a comparatively large "take" of thallium treated grain without appreciable death of rats following; this is especially so in the case of weak baits such as 1:1000 thallium treated wheat. On the other hand the take of phosphorus bait may be so low as to be barely noticeable, yet it is so highly poisonous that there is a heavy mortality among the rats.

Rat Population Studies.

It very early became obvious that some method of estimating rat populations in the field was an important necessity. If we are to judge the effect of poison baits laid in a field then we must have some method

of estimating the number of living rats present before and after the baits were laid. As stated above the observed "take" of baits may be very misleading; the rats might even carry off the baits to line their nests or, on the other hand, a bait which contains a fatal dose for one rat might be shared by five rats and they all survive. Two methods of determining rat populations were developed but the one now used is to trap rats in a "live" trap, chloroform them and place a numbered bracelet on the hind leg and let them go. These traps are set out at intervals through the field and a record is kept of the number of rats tagged. A certain number of these tagged rats are retrapped each night and from the proportion which tagged rats form of the total number trapped in any particular night we may calculate the total population. The field rats, it might be mentioned, do not appear to be scared away from traps by the fact that they have been chloroformed

Rind Hardness and Rat Resistance.

It is found under existing normal conditions that a hard rind affords considerable protection to the larger barrelled canes. It remains to be seen, however, whether this would afford sufficient protection to reduce damage in rat plague years. Hardness of rind does not seem to confer any appreciable resistance on thin canes such as P.O.J. 213 and Co. 290; in these varieties, because of their thinness, even a small amount of feeding on one joint is sufficient to cause the stalk to break off at this point and fall to the ground.

The Giant Toad.

The giant toad has continued to breed rapidly in North Queensland, especially around Gordonvale, where they were first liberated. In this district there should be a large population of big toads, capable of eating cane beetles, towards the end of this year and consequently when the next beetle flight occurs we should be in a position to judge whether this animal is likely to be an important aid in the control of the cane grub. Reports indicate that the toads are breeding in the Isis district, young toadlets having been seen emerging from dams in that area.

Trashing for Beetle Borer Control.

Trashing has often been advocated for borer control and last year we carried out a series of experiments to test this idea on a sound basis. In these trials the cane was trashed more thoroughly than is the case in field practice but it was our desire first of all to test the value of trashing and later to go into the economic aspect. Cane trashed three times had much less borer control damage than untrashed cane and a somewhat higher tonnage was recorded. These trials have been repeated this year in order to study the effects of a less amount of trashing, of the type usually practised by farmers and, when these have been completed, later in the season, we should have a pretty good idea of what the exact effects of trashing are. At the present time our opinion is that trashing will certainly greatly reduce borer damage in places where the damage is great but, at the same time, we are also of the opinion that the same amount of reduction could more profitably be brought about by improved field practices such as have been outlined in previous reports.

What Gives Certain Cane Varieties Resistance to Borer Damage?

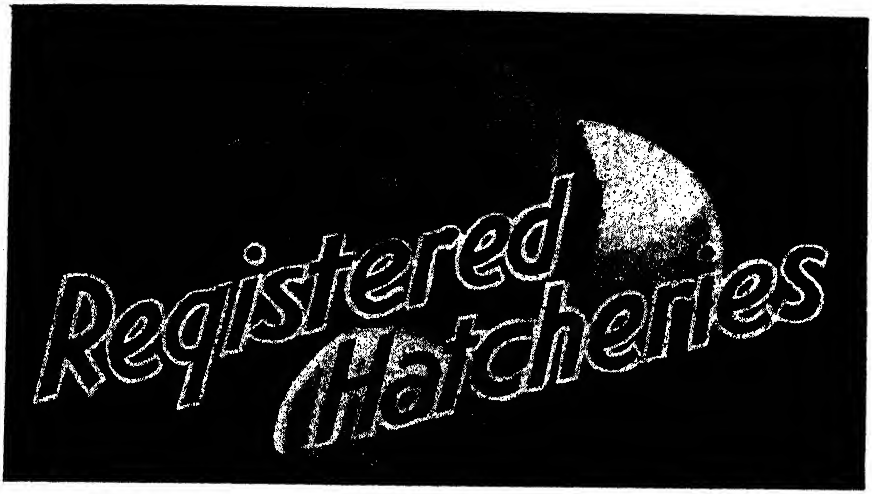
Each year trials of new varieties are carried out in order to test their resistance to borer attack. As a result of several of these trials we can now say that an erect, free trashing variety, with a medium to hard rind, will definitely be resistant to borers. Each of these factors is important and is necessary for high resistance. For example, by hand trashing Badila we may get an erect and trash-free crop, but it will still be moderately susceptible to borers on account of its soft rind, although less susceptible than if it were not trashed. Similarly free trashing and fairly hard rinded canes may become susceptible if they lodge badly. Q. 12 has as least as hard a rind as Q. 2 but yet an erect crop may at times suffer a moderate amount of borer damage, due to clinging trash. Trashing of cane, contrary to general belief, does not increase the hardness of the rind but acts favourably because it removes the shelter which the borers like so much.

Rind Hardness Tests.

With a view to possibly simplifying the determination of borer resistance by cutting out the necessity for field resistance trials we have had constructed a small hand instrument for measuring rind hardness. This instrument has a blunt pointer which works against a spiral spring. As the spring is compressed the pressure increases and finally is sufficient to force the pointer through the rind; when this penetration takes place the pressure is read off on a scale on the instrument. These readings can be made at a very rapid rate and the rind hardness of dozens of sticks can be determined in a day. By this means it is hoped that it will be possible to test large numbers of seedlings and obtain a good idea of their probable borer resistance without resorting to cumbersome field tests.

Fumigation Not Satisfactory for Control of the Frenchi Grub.

Experiments carried out with carbon-bisulphide, alone and mixed with para-dichlorbenzene or ortho-dichlorbenzene, failed to achieve a satisfactory control of the Frenchi cane grub. These experiments confirmed previous experience. Control of this pest is best obtained by observing the following points:—(1) Restrict ratooning and, if possible, fallow for a year after ploughing out; (2) plough infested land during the summer, when the grubs are feeding in the upper layer of soil, so that they may be killed by ploughing operations or exposed to the attack of birds and other insect eaters.



VITAMIN "A" DEFICIENCY.

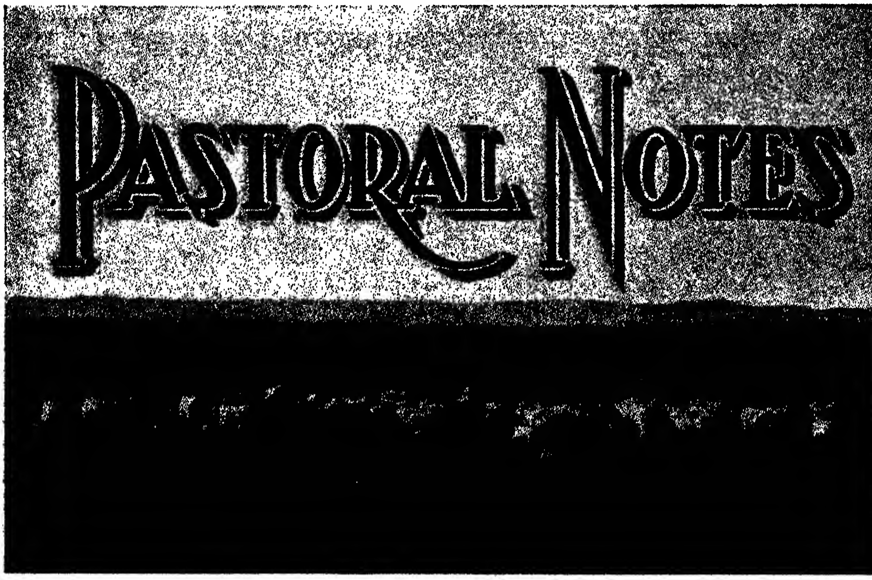
If fowls are deprived of green feed the most serious deficiency which is likely to occur is that of vitamin A. This vitamin is one of the "fat soluble" group; that is, it is present in high concentration in animal fats. But it may be, and customarily is, supplied by the feeding of green-stuff in which is a substance named carotine. This substance is transformed into the true vitamin A by the liver of the animal body and is stored there in relatively large quantities.

The absence of vitamin A is liable to produce very serious effects on poultry, because when supplies of this substance are inadequate the birds are more liable to bacterial infection. Consequently, a conjunctivitis—that is, an inflammatory condition of the eye—first appears and progresses until the eye has the appearance of an abscess. Further, there is usually a moderate mortality, and on post-mortem examination characteristic abnormalities are seen. Most marked is the presence in the mouth and throat of pustules and ulcers, which can be seen when these parts are opened up carefully. Another characteristic alteration, which is more difficult to detect, occurs in the kidney. Fine white lines may be noticed running through the tissue of that organ. This change is brought about by the deposition of substances called urates, which are excreted from the body by the kidneys.

The occurrence of this disease may be prevented by the feeding of adequate green-stuff, but it is realised that this may be difficult and expensive at the present time.

Additional foods rich in vitamin A are milk and milk by-products, yellow maize, and cod liver oil.

A cheap and convenient method of supplying vitamin A is to feed a goodly proportion of maize or maize meal to poultry.



"Rattle-Pod"*—A Plant Suspected as Poisonous to Stock.

DR. J. LEGG, D.V.Sc., Senior Veterinary Officer.

THIS plant is a native of tropical Africa, and has been introduced into many tropical and sub-tropical countries as a green manure. It is a bush 4 to 6 feet high, or even more, with a rather woody stem. The stem, leaf-stalks, and under-surface of the leaves are covered with short, rather scattered hairs. The leaves consist of three leaflets, borne at the end of a common slender leaf-stalk. The middle leaflet is somewhat larger than the side ones. All the leaflets are elliptical in shape and measure 1½ to 2 inches long and ½ to ¾ inch broad. The flowers are yellow, pea-shaped, and are borne in a raceme at the end of the branches. The pods are inflated, clothed with short hairs, and are about ¾ inch long. Numerous seeds, which are hard, shining, and reddish brown, are present in each pod.

It belongs to a group known as the "rattle-pods," several of which are known to be poisonous to stock, and as it was felt that this particular species, which has been introduced into Queensland for use as a green manure crop, might also be poisonous, the Poison Plants Committee of the Department of Agriculture and Stock arranged for it to be tested on sheep, with the results shown below.

Feeding Test.

A sample of the mature plant carrying flowers and half-ripe pods was received in April of this year from one of the North Coast districts, and was placed before sheep which had been starved. They nibbled a little at the plant, but although hungry, they evidently preferred to starve rather than consume it.

* *Crotalaria goreensis.*

Drenching Tests.

Since the animals would not eat the plant in the natural manner, it was decided to make water extracts by cutting up into small pieces weighed portions of the plant and soaking them overnight in water. By this means it was hoped that any poisonous principles of the plant could be extracted and then administered to the animals by means of the stomach tube.

A sheep was first starved for twenty-four hours and then given the watery extract obtained by pressing out the juice from 1 lb. of plant in 1 litre of water after soaking for twenty-four hours. This was repeated on each of four consecutive days, the sheep being allowed a small feed of bran and chaff each evening. The experimental animal was in no way inconvenienced.

Conclusions:

(1) Sheep will not eat the plant, which appears to be obnoxious to the animal.

(2) Drenching of sheep with watery extracts failed to produce any symptoms of poisoning.

(3) Although the plant is grown in areas where sheep are less likely to have access to it than cattle, it is considered that the results obtained with experimental sheep would not have been different had cattle been used.

BONE CHEWING.

No animal can thrive unless its food contains an adequate supply of certain elements, including the minerals phosphorus and calcium. The requirements of the different farm animals are, however, not the same. Normally, sufficient phosphorus to maintain the health of cattle is contained in the pasturage, but for various reasons—e.g., phosphorus deficient soils, and a succession of years in which the rainfall is scanty—a deficiency in this element arises in the natural feed.

An early symptom of phosphorus deficiency is a marked desire shown by affected animals to eat bones and offal. This condition is fairly common in parts of Queensland. Animals develop dropsical swellings, stiffness in gait, and symptoms similar to those of rickets in children. Young cows about the time of first and second calf, milking cows, and cows heavy in calf make heavy demands on the available phosphorus and are therefore very susceptible. Dry cows and older stock are less liable to suffer. Stock suffering from a shortage of phosphorus will chew bones, pieces of wood, bark, earth, &c.

Treatment, except in extreme cases, is followed by good results. On the smaller holdings where animals are watered at troughs, the addition of 6 drams of phosphoric acid to each 10 gallons water, supplemented by a ration of bran and chaff, gives very satisfactory results. Under station conditions, a lick containing sterilized bone meal two parts, and coarse salt one part—a proportion of 2 to 1—with the addition of molasses to increase palatability, should be made available to the animals.

CASTRATION OF COLTS.

W. DIXON, Inspector of Stock.

SPRING is the best time of the year to castrate colts, especially when, as at present, green feed is available.

The colts to be gelded having been yarded over night, it is desirable, before proceeding with the operation, to take precautions against losses through infection of wounds. Crude carbolic acid or phenol in a solution of 7 oz. to 1 gallon is a suitable disinfectant, and should be sprayed over the ground and rails of the yard.

All instruments used should be sterilized by boiling for at least ten minutes, and should be wrapped in a sterile towel and kept in a box at the yard until required.

After each colt is done the instruments and hands of the operator should be washed in a weak solution of carbolic acid, this solution being kept in a separate vessel, and only sufficient for each disinfection being poured into a dish for the purpose, and then thrown away. The practice of using a petrol or kerosene tin filled with disinfectant to wash instruments and hands time after time is risky.

For unbroken colts, the rough and ready methods of roping, choking, and throwing as practised on many stations may cause the loss of valuable animals. These losses may be minimised if a crush with side gates is available, so that the colt can be haltered and side lines used on him before the gate is opened to cast him.

The colt having been cast on his left side, the hind legs drawn up to the shoulders and made fast with half hitches, the fore legs can now be secured with the knees bent to the hind feet.

The scrotum, sheath, and penis should be washed with warm water and soap, care being taken to remove any suety deposit from the penis and the cavity at the end of the penis. The left or lower testicle (the colt being on his left side) is seized in the left hand, and pressed until the skin is tight over it; a bold incision from front to back, parallel with the median line, is now made, penetrating the outer skin and the tunica, laying the testicle bare. As the incision is made, the cord should be grasped firmly in the left hand to prevent the retraction of the testicle upwards through the canal. When this happens it is sometimes difficult to recover, and the subsequent manipulation in an attempt to bring it down delays the operation, and causes unnecessary shock to the patient. The knife is now slipped between the anterior and posterior portions of the cord, and the latter (posterior), which the muscle retracts, is cut completely through.

The testicle now lies inert, connected by the anterior portion of the cord, which is composed of blood vessels, and should be drawn out until it is taut, without using force, when the emasculator (if that method is being used) should be used close to the belly, with a slow squeezing movement, taking care that the crushing part is nearest to the belly, and the cutting part to the testicle. The cord should be severed as short as possible, so that it may not hang below the wound, and so cause complications.

The other testicle may now be removed in a similar way.

It is advisable to swab the wound with a solution—1 to 2,000—of chloride of mercury. The ropes may now be removed, and the colt allowed to rise and walk out of the yard, so as to be away from dust.

If the operation has been performed carefully, and all antiseptic precautions taken, recovery should be rapid and no further treatment is necessary, but if undue swelling is noted, the wound should be opened with the fingers, after washing the hands with carbolic solution, so that there may be free drainage, and the wound swabbed with disinfectant.

Some bleeding always occurs, but rarely lasts for more than half an hour, but if copious bleeding persists after that time—as is the case when emasculators have been used carelessly—the cord must be found, and the artery tied with silk thread. If the stump of the cord cannot be found, the canal should be plugged with pledgets of tow or wool soaked in muriate of iron of the same strength as obtained from the chemist, which helps to form clots, and so closes the artery.

A CAUSE OF SHIVERS OR STAGGERS IN STOCK.

About this time of the year, specimens of henbit or dead nettle are received by the Department of Agriculture and Stock, mostly from the Darling Downs. It is a native of Europe, but is now naturalised in most temperate countries. It is very closely allied to stagger or mint weed, and, like it, causes staggers or shivers in working or travelling stock.

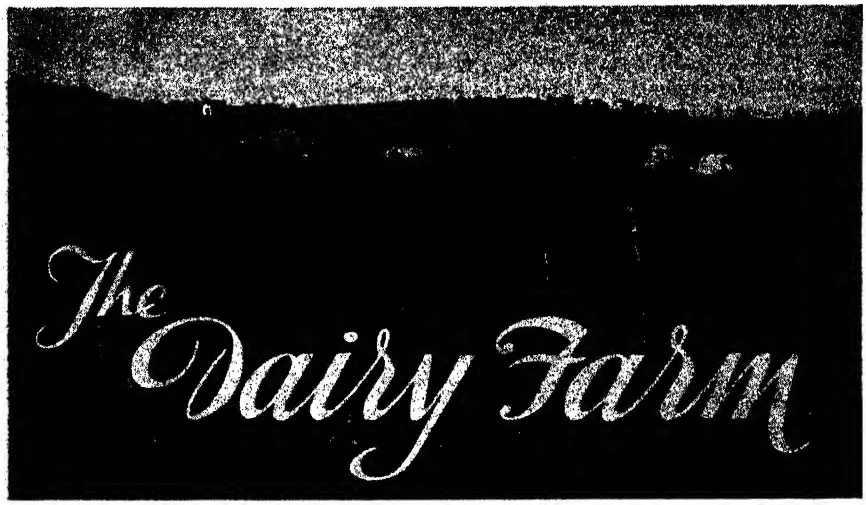
From feeding tests conducted in New South Wales, it would appear that the main symptoms result from the intoxication of the central nervous system. Post-mortem examination showed organs, muscles, &c., to be normal.

No poisonous principle has been extracted from the plant, and it is rather remarkable that although both it and the common stagger weed are abundant in parts of Europe and North America, they have never in those countries been accused of causing staggers or shivers in working animals, as they do in Australia.

No great alarm need be felt, as animals recover when taken away from affected areas or put on to ordinary feed. The symptoms, however, may continue in a modified form from a few days up to three weeks, according to the severity of the attack.

Description:—The plant is a rather weak, fleshy herb, about a foot high, the leaves opposite, mostly of a rather pale green, and rounded with blunt teeth on the edges. The flowers are like a garden salvia in miniature, and are purplish in colour. The seeds are small and usually occur in groups of four at the base of the calyx.

—*C. T. White.*



HERD TESTING AND PROFITS.

The problem facing all dairymen is how to produce the maximum amount of butterfat at the lowest possible cost, while at the same time maintaining, or improving, the fertility and carrying capacity of the pasture and the health of the stock. On the farmer rests the responsibility for efficient pasture management; and on the stock that of producing the maximum amount of fat from the food consumed.

Some farmers may claim that they have good cows, and base their claim on factory returns. This, however, is only evidence that the herd as a whole is good, and not that each individual member of it is producing enough fat to pay its way. A drop in factory returns is unexplainable to such farmers, and when it happens they are in a quandary as to where the remedy lies.

The farmer who submits his herd regularly to testing can see—by comparing the production records of mothers and daughters—whether production is being maintained, whether the right cows are being used for breeding, and whether the herd sire is producing profitable or unprofitable heifers. By this means, he is able to remedy any possible fault before it affects his factory returns to any noticeable extent.

The productive ability of a cow can be ascertained only by testing. The figures obtained indicate her ability as a producer, under the existing feeding and management conditions, which are controlled by the weather and the farmer. There is ample evidence available to show that the average herd contains animals which do not produce sufficient fat to pay for the food which they consume.

Herd testing is essentially educational. The figures merely disclose the facts, and the responsibility is upon the farmer to act accordingly. A farmer who neglects to cull unprofitable animals has only himself to blame if production is stationary or shows a decrease. Failure to act on the part of the farmer cannot be construed, by any means, as a failure of the system of herd-testing.

—*L. A. Burgess.*

ANIMAL MANURE ON DAIRY FARMS.

On the dairy farm, cow dung accumulates both in the holding yards and in the grazing paddocks. Periodically, the manure about the yards is collected and usually distributed on cultivation areas as a fertilizer. Cow manure contains a moderate amount of fertilizing materials which come originally from the pasture area, and to use the manure on crops to be sent away from the farm is virtually "robbing the pastures to keep up the fertility of the ploughed fields."

Far more serious, however, is the neglect of many dairy farmers to make good use of the manure left in the grazing paddocks by the stock. A dropping allowed to lie undisturbed, in addition to losing much of its fertilizing value to the air, promotes in that particular spot a rank growth of grass, which stock find distasteful. If full advantage is to be taken of the fertilizing value of the manure, the droppings should be spread uniformly over the paddocks before they become caked. The dung may be distributed with a special pasture harrow, or by running an ordinary peg harrow over the area, and about which several lengths of barbed wire are loosely coiled. A weatherboard or similar type of timber drag is quite satisfactory, but its use on wet dung in dry weather should be avoided in order to prevent the fouling of the pasture by extensive smearing.

MILK FROM NEWLY-CALVED COWS.

With the approach of spring, dairy farmers should be careful about their increased milk supplies, especially colostrum milk. The milk of the newly-calved cow is abnormal, and is called colostrum or beastings. It is yellow in colour, has a rather strong pungent taste, an unpleasant odour, a sickly albuminous flavour, a high specific gravity, a high total of solids, high albumen, and low figures for fat and sugar. The fat of colostrum has different properties from that of normal milk, and the sugar is largely glucose and not lactose—it also shows a larger proportion of phosphate.

Colostrum milk serves only as food for the new-born calf, and not as a means of increasing the supply to the factory. Besides serving as food for the calf, it also increases the resistance of the calf to disease during the first few days of its existence. The milk approaches normal day by day until, in seven days after calving, it is practically normal, although it may take up to a fortnight to attain perfect normal composition.

It is advisable to isolate the newly-calved cows, and for the first seven days at least this colostrum milk should not be mixed with normal milk, either for butter or cheese making. Cream from such milk blended with good cream results either in the whole delivery being graded down to second grade, or in its being completely rejected. For that reason, this milk should not be separated at all. Colostrum milk is quite unfit for cheese-making, since it is easily coagulated by heat, curdles very slowly with acids and rennet, and results in very poor quality cheese.

It should be remembered, therefore, that:—(1) Colostrum milk is food for young calves only; (2) it should on no account be sent to cheese factories or, as cream, to butter factories.

—*O. St. J. Kent.*

MILK PRODUCTION IN SUMMER.

With the approach of warmer weather, it will be necessary for dairy farmers to take greater care in milk and cream production, if defects in milk or cream are to be avoided.

Milk is an ideal food for bacteria—microbes or germs as they are popularly called—which thrive on milk and soon spoil it, with the result that not only the milk, but its derivatives are degraded in quality. Spring and summer temperatures in Queensland are conducive to the rapid multiplication of most bacteria, and the summer heat especially favours organisms which impart objectionable taints to milk and cream.

The prevention of faults in milk and cream is almost entirely dependent on the methods of production. It may be claimed that clean milk production calls for much greater effort and correspondingly increased costs, for which there are no compensating returns. This is not so. Milk of a very low bacteria count may be produced with little, if any, additional work or time in ordinary hygienic surroundings and with inexpeneive equipment. On the other hand—although not usually—dirty milk may be produced in elaborate buildings and with faultless equipment. Success in clean milk production, like most other activities, depends largely on the will of the persons engaged in it. If those responsible exercise cleanliness and care in every operation from the moment the milk leaves the udder until the delivery of cream at the factory, undesirable fermentation caused by the entry and multiplication of harmful bacteria will be largely prevented, because the normal lactic acid-producing bacteria are more likely to gain control and suppress the growth of the objectionable types. With milk for cheese making an attempt should be made to check the development of too much acid by keeping the evening's milk as cool as possible while it is being held overnight on the farm. Passing the milk over a tubular metal cooler through which water is circulating is the method for rapidly cooling milk most easily adapted to ordinary farm conditions.

The chief factors governing the production of choice quality milk and cream are set out briefly below:—

1. Clean flanks and udders with a cloth moistened in water in which there is a weak solution of Condy's fluid.
2. Wash the hands before, and as often as necessary during milking.
3. Thoroughly clean and sterilise utensils after use in the following manner:—
    - (a) Rinse with cold or lukewarm water.
    - (b) Wash in hot water in which washing soda is dissolved using a scrubbing brush for the purpose.
    - (c) Immerse in, or scald with, boiling water.
4. Allow utensils to drain and dry in an inverted position on a dust-free rack. Do not use a cloth to dry them.
5. Cool milk and cream immediately after milking and maintain as cool as possible until delivery.
6. Exercise care in sterilizing utensils at all times, and more than usual care in summer when temperatures are more favourable for bacterial multiplication.

—*E. B. Rice.*

SOME CAUSES OF STERILITY.

In each year, with careful management, the proportion of calves dropped should approach 100 per cent.; but on many dairy farms, perhaps, the number of calves dropped ordinarily would not approximate 80 per cent. Hence, about one-fifth of the progeny is lost.

Apart from disease, the most common causes of sterility are protracted periods of semi-starvation, and the other extreme of overfeeding. The latter cause usually occurs among cattle prepared for the show ring. But with show cattle the trouble may be overcome by making the animals work hard for their living, by turning them into a paddock where feed is short, and where they have to walk long distances to grass and water.

When starvation is the cause, the remedy is obvious. Failure to make provision for the hard times, which always come along, leads to loss through cows not breeding regularly, involving the loss of the calf, the production of the cow, and often the cow herself.

The provision of stacks of hay or silage in favourable seasons, and keeping them in reserve until required, may make all the difference between profit and loss.

The breeding animal should be of adult age, neither under- nor over-fed, and should have moderate exercise.

The common practice of allowing the bull to run with the cows is not commendable. With the bull under control, he is able to serve many more cows, and the time of cows coming in may be so arranged that they will calve when feed should be available in normal seasons, and when butter fat is not usually at its lowest price.

—*W. Dixon.*

WHAT IS PROFITABLE DAIRYING?

Some farmers consider that the more cows they milk, the more efficient and profitable their dairying practice becomes. But when success in dairying is mentioned, many other factors must come into reckoning.

Pasture management, milk and cream quality, and stock diseases can all be controlled by the farmer. Good pasture management requires the introduction of the best grasses, rotational grazing, the conservation of fodder, pasture renovation, and the use of any necessary fertilizers.

The quality of milk and cream is controlled largely by the attention given to milking, separating, storage on the farm, freedom of the pastures from milk-tainting weeds, and the health of the herd. The incidence of disease in the dairy herd, of course, depends largely on the care and attention given to the animals.

The milking capacity of the herd depends obviously on the milking capacity of the individual cows. The question as to which are the best producers can be determined by systematic herd testing. Unprofitable cows should be culled as soon as practicable. Only the best cows should be kept as breeders. Boiled down, the yield of butter-fat to the acre determines the soundness of dairy farm management.

Good farm management and a poor herd are just as bad as a good herd and poor management. Good management and a good herd together must result in a high yield per acre.

—*L. A. Burgess.*

Agricultural Notes

Dwarf Grain Sorghums.

N. A. R. POLLOCK, Senior Instructor in Agriculture.

DURING the past two seasons on the Darling Downs trials of several dwarf types of grain sorghums, introduced by the Department of Agriculture, have demonstrated their superiority to maize in yield of grain as well as fodder. Maize, as is well known, is injured by a check in growth through insufficient soil moisture, while the yield is further depleted if dry weather is experienced at the tasselling stage. Sorghums, on the other hand, will withstand much dry weather and yield a crop under conditions that would cause maize to fail. Their culture on the Darling Downs and other districts where the average annual rainfall does not exceed 30 inches is commended.

Analyses made by the Agricultural Chemist of the growths at the flowering stage and when the seed had matured and been harvested, as well as the grain, show the following digestible nutrients. Those of maize and wheat are given for comparison. All are calculated as moisture-free, so it will be necessary to take one-fifth to allow for 80 per cent. of moisture at the flowering stage, one-fourth to allow for 75 per cent. of moisture when the grain was removed, and nine-tenths to allow for 10 per cent. of moisture in the grain.

At Flowering Stage.	Digestible Nutrients per 100 lb.			
	Crude Protein.	Other Nutrients.	Total.	N. Ratio.
Dwarf Pink	6·53	57·95	64·48	1 : 8·8
Kalo	7·09	55·67	62·76	1 : 7·85
Brown Yolo	7·23	56·41	63·64	1 : 7·8
Wheatland Milo	7·52	54·71	62·23	1 : 7·27
Mature, less seed head—				
Dwarf Pink	5·33	51·08	56·41	1 : 9·58
Kalo	6·16	46·93	53·09	1 : 7·61
Brown Yolo	6·62	47·51	54·13	1 : 7·1
Wheatland Milo	8·14	44·51	52·65	1 : 5·46

Grain.	Digestible Nutrients per 100 lb.			
	Crude Protein.	Other Nutrients.	Total.	N. Ratio.
Dwarf Pink	12·96	76·23	89·19	1 : 5·9
Kalo	11·25	78·91	90·16	1 : 7·0
Brown Yolo	9·96	80·39	90·35	1 : 8·0
Wheatland Milo	11·34	80·18	91·52	1 : 7·0
Maize	8·38	87·42	95·8	1 : 10·4
Wheat	10·24	78·92	89·16	1 : 7·7

The digestibility of a foodstuff is a measure of its value when fed alone. Better results may be expected when it is fed as part of a balanced ration.

The fodder analyses are illuminating, especially of the plants after the seed head had been removed. At the latter stage the stems were still succulent and making a regrowth noted by shoots from the stems. This regrowth accounts for the satisfactory protein content and allows the nutritive value to be only approximately 10 per cent. less than at the flowering stage. After maize is harvested the value of the stalks is negligible for fodder purposes. Though maize grain shows higher in total nutrients owing to a greater fat or oil content, the nutritive ratio of the sorghums is much more satisfactory and about on a par with wheat. For all classes of stock sorghum grain appears to be suitable, but crushing or grinding may be advisable in the case of very hard grain for cattle, horses, and pigs, as much of it would otherwise pass whole through the digestive system. For sheep, which masticate more thoroughly, and poultry, crushing does not appear imperative.

Yields of grain from the dwarf varieties under good seasonal conditions can be expected up to 40 or, possibly, 50 bushels per acre.

Three to four pounds of seed are required to sow an acre in drills around 30 inches apart. As the plants stool fairly freely, the dropping of single seeds 4 or 5 inches apart in the rows is indicated. Satisfactory sowing can be effected with the combine by blocking the runs between the first, fifth, ninth, and so on to space the rows 28 inches, or the first, sixth, eleventh, and so on to space the rows 35 inches apart.

The time to sow will be dictated by seasonal conditions, late November or December being suggested for the Darling Downs and Maranoa. This should allow of flowering after the heat wave has passed and of maturity being reached before frost occurs.

Inter-row cultivation should be practised or the crop harrowed after the plants have become established. Harvesting is effected by the header in a similar manner to wheat. Slight adjustments, however, in the machine are desirable to prevent undue cracking of grain. The speed of the cylinder may be reduced to two-thirds or a half of that used for wheat, though that of other parts need not be altered. One or two rows of concave teeth might be removed and the remainder lowered if much grain is being cracked, but the clearance between cylinder and concave teeth should be uniform. Adjustments of the sieves will also probably be suggested during use.

It cannot be said that a market exists for any large quantity of sorghum grain, but its value on the farm in the drier districts warrants its production owing to a higher grain yield with a better nutritive ratio than maize and for the value of the fodder remaining when the grain has been removed. The dwarf varieties can be expected to carry less caney matter or hard fibre than taller-growing kinds, and to be thus more suitable for sheep. As the crop would be harvested when wheat, oats, &c., are being grazed in early growth, access thereto would allow the animals to secure a better balance in the food daily consumed. For topping up sheep or lambs the feeding of lucerne hay with the grain in a self-feeder for ten days or so should obviate wastage in transit to market and provide a bloom on the dressed carcase that would add to its value.

LUCERNE AS A GRAZING CROP.

The success of lucerne as a grazing crop depends so much on the way in which it is treated during growth that every consideration should be given to methods which will prolong the life of the stand and ensure maximum production from it.

If possible, grazing by heavy stock should be avoided for the first twelve months, the best method being to run sheep on the new stand of lucerne and feed only half the growth. This promotes maximum root development at an early period, and establishes greater resistance against summer heat and dry weather.

A common cause of failure with lucerne is overstocking. In a dry spell, when native grasses are going off, there is every temptation to crowd stock on to lucerne paddocks, and the crop is thus over-grazed. Even if plantings have to be made progressively year by year, every effort should be made to bring the area of lucerne up to a level consistent with the maximum number of stock it will be expected to carry. After some experience this can be done without much difficulty, taking into consideration such factors as soil type, carrying capacity of the property, other crops grown, and the conserved fodder available.

Rotational grazing is very desirable with lucerne. Feeding off has to be controlled in order to prevent grazing too close to the ground, which injures the crown of the plant and may thin the stand out considerably. Grazing in one large paddock is very wasteful.

One of the most important factors in lucerne management is renovation. The beneficial results following this practice have been amply demonstrated on the Western Downs, and it can be stated quite definitely that renovation at least once or twice a year is essential. Tynes are preferable to discs for this work because of the danger of cutting the crowns with disc implements. The stirring of the soil around plants helps in the distribution of manure over the paddock, aerates the soil, allows rain quicker access and easier penetration to roots, and forms a soil mulch which decreases the evaporation of moisture. Renovated paddocks, therefore, retain vitality for a longer period, recover more rapidly after grazing and after rain, and are less likely to thin out during droughts.

—*C. F. Defries.*

PREPARATION OF SEED-BED FOR PASTURE.

Various types of seed-bed, ranging from uncultivated forest land to the onion-bed type, are employed for sown pastures. The seed-bed provided by partly cleared forest land, even though some form of harrowing has been done, is very unsuitable for pasture establishment, the competition of native grasses and undergrowth usually proving too severe for the seedlings of sown pastures. Likewise, established pastures of native or other grasses are not receptive of additional pasture plants unless a disturbed seed-bed is provided, and a temporary check given to the growth of the established plants, by drastic harrowing. The ashes resulting from scrub burns provide quite a good seed-bed for pasture plants.

By far the best seed-bed is that resulting from the thorough tillage of fertile soil. Most of the common pasture plants have small seeds and require a seed-bed of fine tilth, and by compacting the soil close to the surface a seed-bed is provided which is favourable to the fine, early root systems of the pasture plants. The seed-bed should contain ample moisture, and in dry districts, particularly, cultural operations throughout the seed-bed preparation period should be done with due regard to the conservation of moisture. Ploughing well in advance of sowing is desirable, and the land should be allowed to lie in the rough state for a few weeks before further cultivation is undertaken. Heavy tine harrows, or a spring-tooth cultivator, will be required to break down the clods. Subsequent working should be designed for the destruction of weeds and the compaction of the sub-surface soil, and shallow harrowings will help. If the land becomes weedy and the surface sets hard, a disc harrow may have to be used to destroy the weeds. Rolling before sowing may be desirable in cases where the ordinary cultivation has not sufficed to form a fine seed-bed.

—*C. W. Winders.*

GRADING OF ONIONS.

Onion harvesting generally will commence in October. Flavour, size, firmness of texture, and capacity to carry well without serious bruising or other damage all influence their market value.

Buyers, however, sometimes complain of onions being marketed without due regard to their classification in accordance with the size of the bulbs. It is the custom of some growers to include large and small sized onions in the same bag. This practice is against the interests of the farmer, contrary to the wishes of the selling agents, and results in comparatively lower market values.

Onions should be classified according to size. The small sized onions —say, below 2 inches in diameter—should represent one "size" grade. Onions ranging from 2 inches to less than 3 inches in diameter should comprise another grade, and onions from 3 inches to 4 inches in diameter should form still another grade.

Some growers prefer to classify the onions in grades in accordance with each ½-inch increase in diameter. This practice ensures evenness and uniformity in appearance in each grade.

The number of grade classifications should be determined by the variation in the size of the individual bulbs comprising the crop. In ordinary circumstances, the classification of the bulbs into three or four grades will suffice. It is important, however, that the onions should be graded as evenly as practicable. All "outsized" bulbs, especially the onions which are coarse, and are customarily referred to as "bull-necks," should be rejected.

Queensland Pigs in London.

QUEENSLAND'S pig industry was well represented in the All-Australian Export Pig Competition conducted by the Australian Meat Board and judged in London last June. Of the twenty-one exhibits of porkers Queensland provided eleven entries, and the same number of entries in the total of seventeen baconer exhibits. The pigs came from Central and Southern Queensland.

The Queensland exhibits were as follows:—

BACONER CARCASES.

Name.	Breeding of Pigs.	Percentage of Marks Gained.
A. J. Cliffe, Mundubbera	Tamworth x Berkshire	78·8
Port Curtis Co-operative Dairy Association, Biloela	Large White	68·0
W. A. Collard, Maleny	Large White x Berkshire-Tamworth	73·06
J. Alcorn, Maleny	Large White	74·93
A. Herron, Conondale	Berkshire x Large White	63·2
A. Ley, Kinleymore	Large White x Gloucester Old Spots	56·0
Kingston Pig Farm Co., Kingston	Large White x Large White x Large White-Poland China	77·33
Kingston Pig Farm Co., Kingston	Large White	75·2
A. Hemes, Salisbury	Large White	77·6
O. F. Haack, Beenleigh	Tamworth x Middle White	79·2
H. B. Kerner, Ipswich	Middle White	64·55

The winning entry of baconer carcases was a pen of Large Whites exhibited by Mr. A. Virgano, South Morang, Victoria; these carcases scored 81·33 per cent.

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OVER 300 PRIZES, TROPHIES, AND CUPS SINCE 1932

"LAWNHILL" STUD of TAMWORTH PIGS

I have a few selected bred sows to St. Cloud Hero. (Impt. in Utero), ex Earmont Knick Knack, winner of sow and litter class, champion Tamworth sow, and winner of Anniversary Medal for best Tamworth pig in New South Wales, at Sydney Royal Show, 1938.

I also have a few very classy boars, ex Wattledale Lydia Pride, farr. 1st Jan. These boars are of exceptional quality.

A few boars ready for service, prices reasonable, further particulars apply—

PERCY V. CAMPBELL, LAMINGTON, QUEENSLAND

PORKER CARCASES.

Name.	Breeding of Pigs.	Percentage of Marks Gained.
Port Curtis Co-operative Dairy Association, Biloela	Large White x British Black ..	67·53
Salvation Army Farm, Riverview ..	Tamworth x Middle White ..	63·77
M. G. Bayliss, Maleny	Large White	77·39
Kingston Pig Farm Co., Kingston ..	Large White	74·49
O. F. Haack, Beenleigh	Berkshire x Tamworth	71·59
A. F. H. Johnston, Chermside ..	Middle White x Berkshire-British Black	53·63
G. W. Winch, Zillmere	Middle White x Tamworth ..	58·26
G. W. Winch, Zillmere	Middle White x Berkshire.. ..	62·90
H. B. Kerner, Ipswich	Middle White	65·22
T. Bradshaw, Chermside	Middle White x British Black ..	60·58
A. F. H. Johnston, Chermside ..	Tamworth x Berkshire-British Black	53·04

The winning exhibit in the porker carcase class also was an entry of Berkshires from Messrs. Wickham and Candy, O'Halloren Hill, South Australia; these pigs gained 79·12 per cent.

Commenting on this competition Mr. L. A. Downey, Instructor in Pig Raising, says:—

The outstanding observations from the results of carcase appraisal so far are the amount of overfatness and deficiency in body length of the majority of the Australian pigs. Of the 114 pigs appraised in this All-Australian export competition 80 per cent. were overfat and only two pigs reached the required standard of body length. Whilst excessive fatness aggravates the relative body shortness, it is found that of the 20 per cent. of the pigs in this competition which were not overfat, all except one were still below the standard for body length. The average total marks gained by all pigs in the competition were 67·83 per cent., but the average marks gained by all pigs for body length were only 55.31 per cent.

Body length is one feature which is just as important to breeders as to the pork and bacon trade, for it is an indication of capacity to produce and rear large and good litters, and extra body length means increased weight in pigs.

Every breeder strives to produce long-bodied pigs, and most breeders think they have done so, but carcase appraisal has shown how far astray some breeders are in their visual judgment of body length. It is not until the tape is placed on two fixed points on the carcase and that measurement valued according to the weight of the pig that one can say with any degree of certainty whether a pig is long or short in proportion to its weight.

WHAT CANADA IS DOING.

The Canadian Chamber of Agriculture has undertaken the task of fully informing the farmers of Canada of the decisions of the Sydney Conference and of observing their reactions to the conference proposals. Like Australia, Canada is a land of immense distances and varied agricultural interests, so the job will take some time. The Sydney decisions have been circulated far and wide. The interest shown in the reports so far is remarkable, and it is believed that when definite decisions are made they will be in favour of organised and orderly marketing within the Empire on the lines laid down.

WHEN BUYING A PIG.

It is not every day that we buy a pig, so it is worth while remembering a few points when considering the purchase of stores. Having decided the class and type of animals required, the next thing to do is to inspect the pigs on offer. Move them around and inspect each one individually, observing defects like rupture, rough, coarse skin and hair, and estimating what is the real and not the apparent average weight.

A point that cannot be overstressed is that if a pig sale is attended for the purpose of purchasing stores and there is nothing really suitable on offer, or the prices are too high, it would be wise from a financial point of view to forget all about them.

Far too many people just buy because that was their original intention, forgetting the point as to whether the pigs put up for auction are worth a higher bid.

It is important to know the highest figure that should be bid, and the one which will turn out to be economically sound when the pigs are fattened up to pork or bacon weights. The class and age of the animals, of course, must be considered, but it is just as well to make sure that there is a reasonable margin of profit in prospect when the pigs go eventually to the butcher or the bacon curer. Only a simple calculation is needed, and the error, if any, should be on the low side, for optimism may turn out to be monetarily disastrous.

It is impossible to get away from the fact that some people are born salesmen or born buyers, but the qualities of both can be cultivated. It is a good thing to know just when to "get in" or "get out," but that knowledge must go hand in hand with sound practical farm management. A note of warning: Cheap pigs in low condition are no good to any man, and must eventually cause a heavy instead of a light expenditure.

YIELD OF CARCASE IN PORK AND BACON PIGS.

The loss of weight in transit of a pig from farm to factory, and then during dressing, varies very much, and it is not possible to say exactly what weight a pig will lose.

Factors which affect the amount of loss are:—The size of the pig—the larger pig will lose a lower percentage; how the pig has been fed; the length of the journey from farm to factory; the conformation and condition of the pig and the amount of food contained in its alimentary tract when it is weighed alive.

In tests it has been shown that under conditions similar to those ordinarily ruling in Queensland, pigs weighing 150 lb. to 200 lb. alive on the farm lose about 10 per cent. of this weight in transit to the factory, and then another 20 per cent in dressing. Lighter pigs, weighing 100 lb. to 140 lb. alive, usually lose approximately 33 per cent. by the time they are dressed. Whilst these figures possibly are a fair average, individual pigs vary considerably according to the factors already mentioned.

As a rough guide in estimating dressed weight from live weight, farmers usually take seven-tenths of the live weight for baconers and two-thirds of the live weight for porkers.

—*L. A. Downey.*

GARDEN SEED SELECTION.

In selecting and saving seed for future plantings, the most vigorous, healthiest, and heaviest-bearing plants should always be reserved for the purpose. Type and production are essentials that should always be observed.

Various methods are used in the harvesting and cleaning of garden seeds, but the actual principles remain more or less steadfast. Seeds should not be harvested until fully ripe or mature. It is equally important that the crop should be promptly gathered when the proper time has arrived. If seed be left too long on the plant, sprouting or moulding may occur, and the seed, at least, will discolour. Seeds are generally ripe when the pods or seed capsules turn yellow, or the fruits—such as tomatoes and melons—lose their firmness.

Bright sunny weather should be selected, if possible, for the harvesting of crops which require threshing—such as beans and peas. The plants should be dried thoroughly before threshing, and it is always better to select days of low humidity for this operation. No matter how the seed is threshed, the greatest care should be taken to prevent breaking the seeds. Winnowing is often necessary for the final cleaning of the seed.

In obtaining clean seed of such fruits as tomatoes and melons, the ripe fruits must stand for some time in their juices to remove the mucilaginous covering. A common method is to throw the cut specimens or the scooped-out pulp into any convenient vessel—such as a bucket, tin, or small barrel—and stir daily until fermentation has loosened the covering about each seed. This requires from three to six days. To prevent the discolouring of seeds, the fermentative process should not be continued longer than necessary.

After fermentation, the seeds are separated from the pulp and the skin by washing as often as may be required to obtain clean seeds. The good seeds settle to the bottom of the vessel, while the pulp, skin, and light seeds rise to the top and may be poured off. Three or four washings are usually sufficient, and the use of sieves in this process of separation is recommended.

After winnowing or washing, as the case may be, all seeds must be cured thoroughly before storing. They should be spread in layers on trays in well-ventilated places until completely cured. It is an advantage to wash early in the mornings of bright days to facilitate drying, which should always be done under shade. Seeds may be stored in either cloth or paper bags. The greatest enemy to the preservation of seeds is moisture, but usually the conditions in an ordinary living-room are satisfactory. Provided the seeds are well cured and the humidity remains low, ordinary fluctuations in temperature do not affect the vitality of the seed. It is a well-known fact that seeds do not keep well in North Queensland, because of the great amount of moisture in the atmosphere. Some seeds—such as cabbage, turnip, and radish—stand a very great chance of becoming mouldy unless kept in well-ventilated containers.

THE CHOKO.

The choko is a popular vegetable, grown largely in Queensland for both market and home use. It has the advantage that, once planted, it comes into bearing each year from the original root. The plant will die down only during the coldest months, and in the spring will shoot again from the tuber which is formed under the ground.

The choko requires a rich loamy soil to which has been added a heavy dressing of well-rotted stable manure. Additions of dried blood and bone dust, or of manure during growth, are of great benefit, as being a perennial and a heavy feeder, the choko's food requirements are considerable.

The method of planting the choko differs greatly from that used for other varieties of the same family. Whole choko fruits are used as planting material, the growth coming from the shoot from the kernel in the fruit. The fruit should be planted on the side with the broad end sloping downwards and the stem end slightly exposed.

A trellis is essential to satisfactory growth, although, if planted near a fence or old stump, the plants will spread over it very quickly. When chokos are grown commercially, it pays to erect a suitable trellis. This may be done with logs or rough timber. Sometimes an ordinary "T" trellis is used, over which strong fencing wire is stretched.

A good permanent trellis may be constructed as follows:—Two rows of strong posts are set firmly in the ground with a height of about 6 feet 6 inches above the surface, the rows being about 9 feet apart and the posts about 8 feet apart in the rows. The tops of the posts support cross timbers on which strong fencing wire is stretched with about 18 inches between the wires to carry the vines. Stays support the outside posts, and wires for trellising also should be stretched on these.

The choko takes some months to come into full bearing, but will commence to bear fruit generally about four to five months after planting. The plants seem to improve with age when properly cultivated and manured.

There are two varieties, the green and the cream. The cream-coloured variety is the more popular.

Chokos should be picked fresh and, after having been peeled, should be cut into suitable portions and boiled or baked.

—*C. N. Morgan.*

THE EGG PLANT.

The egg plant is easily grown and produces an excellent culinary vegetable. It is grown similarly to the tomato, and like that plant, is very sensitive to cold. It requires a light, rich, loamy, well-drained soil, and poorer ground may be improved by the addition of a 1-4-1 mixture of sulphate of ammonia, superphosphate, and sulphate of potash at the rate of about 5 cwt. to the acre, or by heavy dressings of well-rotted stable manure to which a small quantity of superphosphate has been added.

For an early crop the seed may be sown under cover during July and August; and, when all danger of frost is over, the plants should be set out about 2 feet apart in rows 3 feet apart. Difficulty may be experienced with transplanting, and, it is sometimes desirable to sow the seed in the permanent positions for the plants after all danger of cold weather has passed.

Cultivation and plenty of water are necessary for the plants, as they do not recover readily after a check in growth. The plants may be staked like tomatoes. As soo as the fruits are formed, they should be thinned out to leave only eight or ten to each plant. The fruits are picked when from 4 to 6 inches in diameter. The time from seed planting to transplanting is approximately two months, and from seed planting to mature fruit five months. The best variety is the New York Purple Spineless.

For cooking, the fruit should be cut into slices, salted, and fried in batter. In boiling or baking, the fruit should be seasoned with butter, pepper, and salt.

—*C. N. Morgan.*

TOMATOES IN THE CENTRAL DISTRICT.

With the higher level of prices which usually operates from September to December, the tomato crop assumes greater importance to the farmers in the tomato-growing areas of the Central district. This period coincides with an increased incidence of pest and disease troubles. Particular attention, therefore, should be paid to the cultural requirements of the plants and to pest and disease control in order to prolong the bearing period.

Normally with tomato patches on scrub burns, weeds do not trouble the young crop unduly; but it is advisable to check the weed growth which sometimes becomes serious at picking time. The soil around the base of the plants should be kept loose, at the same time, with the hoe. In cultivated areas, the land should be kept well stirred and free of weeds, which both rob the soil of valuable moisture and encourage the breeding of pests such as the corn-ear worm and the tomato mite.

Old plants may be cut back profitably if the root systems are reasonably sound and a bunch of fresh growth is shooting from the main stem. If excessive, this flush of new shoots may be thinned lightly. Severe thinning is undesirable, as it is necessary to retain sufficient foliage to keep a reasonable balance between the root system and the parts of the plant above the surface.

A handful of a 4-11-10 chemical fertilizer, containing sulphate of ammonia, superphosphate, and sulphate of potash, should be applied to old plants and backward young plants, in order to stimulate new growth and blossoming. When the first fruit has set, a dressing of 50-60 lb. of sulphate of ammonia per acre will help to keep the plants moving.

Tomato mites spread rapidly as the warm weather approaches, and quickly cause a dying back of the foliage from the centre of the plant. Loss of foliage exposes the stems and the fruit to the hot sun with harmful results. For the control of the mite the plants may be sprayed with lime sulphur at a strength of one in eighty. Alternatively, a dust composed of flowers of sulphur and a good quality hydrated lime in the proportion of 1-1 can be used. If mites already are numerous on the plants, spraying is preferable to the dusting. However, if the plants are treated with a sulphur—lime dust from the seed-bed onwards, a satisfactory control of the mites will be obtained.

Damage by the corn ear worm also increases rapidly in the spring, and may be the cause of heavy losses of fruit if not checked at an early stage. Lead arsenate is the most reliable insecticide for this pest, and may be used as a spray or dust. A suitable spray can be prepared by adding 3 lb. of lead arsenate to 100 gallons of water and including a spreading agent. If mites are troublesome at the same time, colloidal sulphur may be included with the lead arsenate. As a dust, the lead arsenate is used diluted 1-1 with either a good quality hydrated lime or sulphur, the latter diluent having the additional advantage of controlling the mite.

Lead arsenate leaves an objectionable spray residue, and should not be used after the plants have commenced to fruit. Constant attention to the control of the corn ear worm up to this stage, however, gives an excellent chance of a reasonable crop.

Leaf diseases and black spot on the fruit frequently appear as the plants age and lose their vitality. Correct manuring, cultivation and pest control all help considerably to prolong the life of the plant.

When a fungicide is necessary, either a Bordeaux spray or a copper dust may be used to hold the diseases in check. To control pests and diseases with a combination spray, lead arsenate and a colloidal sulphur preparation may be added to the Bordeaux. Lime sulphur cannot be included in a Bordeaux spray, as such a mixture is liable to injure the plants.

Various proprietary dust mixtures containing lead arsenate, sulphur and a copper compound are marketed for the purpose of controlling pests and diseases in one operation.

—*W. J. S. Sloan and W. J. Ross.*

PASSION FRUIT.

Passion fruit vines are prone to several diseases which, with proper attention, can be controlled, but which, when the vines are allowed to grow uncared for, quickly destroy them. Because of these diseases and the old haphazard method of cultivation, the idea has become current among orchardists that vines can be grown only for about two, or, at most, three years. That this is erroneous has been demonstrated by growers who have made passion fruit culture their main occupation, and who have vines bearing well at seven years of age. These growers,

however, prune correctly and spray at the right times, as advised by officers of the Department of Agriculture and Stock. They also grade and pack their product carefully for market.

It is stated by some that passion fruit growing entails too much work pruning and spraying, and that the results are not worth it. That is not necessarily so. Pruning the vine certainly is a tedious and lengthy operation. Spraying also is objectionable, but it should be remembered that citrus growers, grape growers, and practically all other fruit growers must also prune and spray.

Good passion vines produce up to half a bushel of fruit a year. They are usually planted 15 feet by 8 feet apart, or 363 vines to the acre. On a conservative average of 3s. 6d. per half-bushel clear of marketing expenses, the return would be £63 per acre per annum. Are there many other fruit crops netting orchardists this sum an acre?

The passion vine thrives in warm, moist situations, preferably in the coastal districts. It grows well on the coastal highlands, like the Blackall Range and Tamborine Mountain, and also on the lowlands between these and the sea. The vine will resist light frosts, but heavy frosts will cause damage.

Reasonably fertile scrub and forest loams, provided they are well drained, are suitable soils, and if a hillside site is chosen it should be well sheltered from heavy winds and, preferably, have an easterly or north-easterly aspect. It is important that the trellises be strongly made, and that they be at least 6 feet in height.

Two crops are borne each year, a summer and a winter crop, while occasionally intermediate crops are borne.

Spring is the best time to plant, although autumn planting is sometimes practised. Spring-planted vines sometimes return a small crop the following winter, but the first main crop can be looked for twelve to fifteen months after planting. With autumn-planted vines the first main crop often is not obtained until eighteen to twenty-one months after planting.

A pamphlet giving full cultural details is available free on application to the Department of Agriculture and Stock.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

EARLY in September cool conditions prevailed, causing, to some extent, a decrease in the demand for citrus fruits and pineapples. The warmer conditions later in the month improved the market for citrus fruits, apples, and pears. Pineapples, unfortunately, did not share in this benefit because of supplies exceeding requirements. Northern mango-growers are advised not to send fruit until it has fully matured. Well-packed lines of mangoes arriving in good condition are always assured of a satisfactory price. Badly packed fruit spoils the market for future consignments. For Sydney or Melbourne only high-class fibreless types should be despatched, as the common mango is not popular with consumers. Through the repletion of factory supplies, towards the end of the month an oversupply of strawberries developed on the market. The prompt initiation of a scheme for supplying 4-lb. boxes direct to the public proved an unqualified success. The winter crop of bananas is not realising high prices on the interstate markets. The following were the ruling prices for the last week of September:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Smalls, 5s. to 6s. 9d.; sixes, 5s. to 9s.; sevens, 6s. to 12s. 6d.; eights and nines, 10s. to 15s.

Sydney (practically unsaleable).—Sixes, 5s. 6d. to 9s.; sevens, 9s. to 13s.; eights and nines, 14s. to 16s.

Melbourne.—Sixes, 8s. to 10s.; sevens, 10s. to 12s.; eights and nines, 12s. to 14s.

Adelaide.—Good-quality fruit, 16s. to 20s. per case.

Growers are advised to watch for the date for the prohibition of the "small" grade on the Brisbane market.

Brisbane.—Lady's Finger, 2d. to 7½d. per dozen; few special bunches higher.

Pineapples.

Brisbane.—Smoothleaf, 2s. 6d. to 5s. per case, 1s. to 3s. 6d. per dozen (market well supplied); Ripley, 4s. to 6s. per case, 6d. to 4s. per dozen.

Sydney.—Smoothleaf, 5s. to 8s. per case.

Melbourne.—Smoothleaf, 6s. to 8s. per case.

Adelaide.—Smoothleaf, 12s. to 13s. per case.

Papaws.

Brisbane.—Yarwun, 3s. to 6s. tropical case; Gunalda, 2s. to 4s. bushel; Locals, 1s. 6d. to 2s. 6d. bushel case.

Sydney.—3s. to 10s. per tropical case. Too many green lines are being marketed.

Melbourne.—6s. to 10s. tropical case. Green lines unsaleable.

CITRUS FRUITS.

(Brisbane Market only.)

Oranges.—Tamborine Navels, 7s. to 9s.; common, 5s. to 7s.; small sizes, 3s. to 4s. and hard of sale.

Mandarins.—5s. to 11s. per bushel.

Grapefruit.—Gayndah, 8s. to 12s.; Locals, 6s. to 8s.

Lemons.—Gayndah, 6s. to 10s.; Locals, 3s. to 6s.

DECIDUOUS FRUITS.

(Southern Fruit only.)

Apples.

Jonathan, 7s. to 12s.; Granny Smith, 8s. to 15s.; Delicious, 9s. to 12s.; Cleopatra, 7s. to 10s.; Sturmer, 6s. to 10s.; Rome Beauty, 7s. to 10s.; Crofton, 11s. to 12s.; Tasma, 10s. to 12s.

With the advent of warm weather conditions, Southern shippers are advised not to send any of the softer varieties of apples, such as Rome Beauty, Statesman, Delicious, &c., to Queensland, as deterioration is rapid under the warm humid conditions which are likely to prevail in the future.

Pears.

Winter Cole, 10s. to 15s.; Josephine, 8s. to 14s.; Winter Nelis, 6s. to 12s.; Broom Park, 7s. to 10s.

All pears should be wrapped, as unwrapped lines show bad skin-marking.

OTHER FRUITS.

Strawberries.

Brisbane.—4s. to 5s. per dozen boxes; choice, 6s. to 7s. per dozen boxes.

Sydney.—Trays, 1s. to 4s.; boxes, 4s. to 8s. per dozen.

Passion Fruit.

Brisbane.—Choice, 10s. to 12s.; second grade, 8s. to 9s.

Sydney.—6s. to 14s. per half-bushel.

Melbourne.—6s. to 11s. per half-bushel.

Tomatoes.

Brisbane.—Coloured, 5s. to 9s.; green, 5s. to 8s.; ripe, 3s. to 5s.; Bowen, 4s. to 9s.; Yarwun and Ambrose, 6s. to 9s.

Sydney.—Cleveland, 7s. 6d. to 10s. per half-bushel.

Melbourne.—Adelaide Hothouse, 22s. to 23s.; Western Australian, 6s. to 13s.

Cape Gooseberries.

5d. to 6d. per lb.

MISCELLANEOUS, VEGETABLES, &c.

Marrows.

Brisbane.—1s. to 3s. per dozen.

Sydney.—6s. to 8s.

Melbourne.—8s. to 10s.

Cauliflowers.

Small, to 3s. per dozen; choice, 5s. to 7s. per dozen.

Cabbages.

Small, 6d. to 3s. per dozen; large, to 5s. per dozen.

Beans.

Brisbane.—4s. to 7s. per sugar bag.

Sydney.—1s. 6d. to 5s. per bushel case; demand slow.

Melbourne.—3d. to 6d. per lb.

Peas.

2s. to 5s. per sugar bag.

Carrots.

3d. to 6d. per bundle.

Lettuce.

6d. to 1s. per dozen.

Pumpkins.

5s. to 8s. per bag. *Melbourne.*—£10 to £12 per ton.

Beetroot.

3d. to 6d. per bundle.

Cucumbers.

Brisbane.—9s. to 11s. per bushel case.

Sydney.—10s. to 14s. per case.

Melbourne.—14s. to 18s. per case.

CONTROL OF THE RED-SHOULDERED LEAF BEETLE.

In spring, the red-shouldered leaf beetle periodically makes its appearance in the coastal regions of south-eastern Queensland and causes a considerable amount of damage to a number of cultivated fruit trees and ornamental plants. Growers of susceptible crops should, therefore, become acquainted with the method of combating this pest as an invasion of the actively-flying adult beetles takes place without any warning and a delay of only a few days in applying control measures may involve much unnecessary loss.

Excellent control can be achieved by the use of either pyrethrum or pyrethrum and derris dusts. The pyrethrum can be mixed with an equal part by weight of kaolin, a cheap filler, to reduce the cost of the treatment. Dusts containing pyrethrum and derris are available in several proprietary lines.

The dusts are applied by means of a hand blower, preferably in the early morning when the beetles are relatively sluggish and less apt to fly when disturbed. The application should be thorough as the kill depends on each insect actually coming in contact with the dust. In large trees, for instance, dusting should be done both inside and outside the tree. Some beetles will usually be found resting on weeds, &c., in orchards, especially in the early mornings and these should also be treated. Most of the beetles will fall from the tree within a few minutes of dusting and a further light dusting when they are on the ground will increase the mortality rate.

On account of its effectiveness, ease of application, cheapness, and the surprisingly small quantities of dust required, growers can quickly apply this method of control whenever an infestation of red-shouldered leaf beetles occurs.

[*Photo.: "The Telegraph."*

Plate 182.

A young hardwood forest after thinning.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of August, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD 350 LB.).			
Sunnyside Honey 8th (356 days)	P. Moore, Wooroolin	16,630·5	685·619	Bruce of Avonel
	SENIOR, 3 YEARS (STANDARD 290 LB.)			
Chasmin's Daisy	N. L. Siemon, Beaudesert	9,945·15	398·574	Thurles Cavalier
	JUNIOR, 3 YEARS (STANDARD 270 LB.)			
Folkestone Crystal (256 days)	Mr. N. Bidstrup, Ehlma Park, Warra	9,373	386·235	Dinkum of Thorndale
Fairvale Olive	I. H. Anderson, Southbrook	7,024·05	285·596	Blacklands Stately Major
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
College Mayflower 2nd	Queensland Agricultural High School and College, Lawes	7,122·15	253·675	Trevlac General
College Fussy 2nd	Queensland Agricultural High School and College, Lawes	6,370·78	252·224	Duplex of Greyleigh
	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
College Gold 3rd	Queensland Agricultural High School and College, Lawes	8,394·08	326·006	Trevlac General
College Thorn 2nd	Queensland Agricultural High School and College, Lawes	6,978·19	250·505	Trevlac General
College Kitty 3rd	Queensland Agricultural High School and College, Lawes	5,643·95	233·914	Trevlac General
	JERSEY.			
	MATURE COW (STANDARD 350 LB.)			
Eadie of Glenmoore	L. J. Comiskey, Warra	7,405·2	395·818	Beauty's Viscount of Woodbine
	SENIOR, 3 YEARS (STANDARD 290 LB.)			
Trinity Marshall's Coronada (365 days)	C. W. Barlow, Euston Road, Spring Creek, *via* Toowoomba	8,666	496·946	Trinity Field Marshall

	SENIOR 2 YEARS (STANDARD 250 LB.)			
College Floss 2nd	Queensland Agricultural High School and College, Lawes	6,024·65	310·476	**Belgonia Peggy 9th Duke**
Bride of Glenmoore	L. J. Comiskey, Warra	5,253·69	292·566	**Kelvinside Noble Golden Prince**
	JUNIOR 2 YEARS (STANDARD 230 LB.)			
Glenview Flower	F. P. Fowler, Coulstoun Lakes	6,024·15	324·69	Trinity Governor's Hope
Oxford Rivoli Ballerina	E. Burton, and Sons, Wanora	5,956·29	313·831	Oxford Rivoli
Golden Fern of Chelsford	E. J. and H. G. Johnson, Gleneagle	5,356·37	281·318	Gunawah, Benedict
Glenmoore Lila (257 days)	L. J. Comiskey, Warra	4,439·14	243·788	Kelvinside Noble Golden Prince
	FRIESIAN.			
	SENIOR, 3 YEARS (STANDARD 290 LB.)			
Ryfield Ivy Dekol	P. P. Falt, Wondai	8,722·75	352·933	Ryfield Argus II.
	JUNIOR, 3 YEARS (STANDARD 270 LB.)			
Ryfield Dahlia IV.	P. P. Falt, Wondai	7,785·45	310·989	Ryfield Argus II.
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Ryfield Lady 3rd	P. P. Falt, Wondai	7,705·4	306·412	Ryfield Argus II.
	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
Ryfield Ida 7th	P. P. Falt, Wondai	8,374·85	311·076	Dairymaid's Argus
	GUERNSEY.			
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Lilac Pretty Poppy	W. R. Smee, Peeramon	6,236·35	272·779	Mayfield Supreme

The Tropics and Man

Keeping Cool.

DOUGLAS H. K. LEE, Professor of Physiology, University of Queensland.

KEEPING cool! How delightful that sounded; what pictures it conjured up of tinkling ice, chilly breezes and cool waters! With the sun daily mounting higher in the heavens and sun-baked walls nightly reradiating more absorbed heat, the memories of biting winds and frosty skies were becoming even more remote and taking on the quality of those fairy tales which captured our childhood imaginations.

1. The Body as Heat Producer.

To be sensitive to temperature changes is a handicap imposed upon all living matter, but, in the case of animals leading an active physical life, this becomes a veritable old man of the sea to those who live in hot climates. This old man's name is Heat Production. Every single process that goes on in the body from the passage of a nerve impulse to the muscular activity of hard work liberates its quota of heat. Physicists would quote you long and abstruse formulæ about the laws of thermodynamics. Chemists would dwell in loving detail on the miraculously intricate relationship of molecules, their private lives, and their thermal accompaniments. Physiologists like myself would steal boldly from both, but all this would, unless translated into concrete advice or definite action, render the unfortunate tropical dweller not one whit the cooler.

To forestall criticism, and convince you that there is sound reason behind the practical advice which comes later, I must deal a little with the more theoretical aspects of my subject. I have said that every process going on inside the body—and you would be astounded at their infinite number and complexity—liberates some amount of heat, large or small. Even at complete bodily rest considerable activity is going on in most of the tissues. Engines are kept warmed up, supplies of fuel are being transported to convenient sites, repairs are going on, renewals are being effected, a watch is being maintained against emergencies, chemical messengers are still running about their duties, and the nerve telephones of what we call the autonomic system are constantly in use. Even at complete rest, therefore, the body is by no means idle, and a considerable amount of heat is produced. In twenty-four hours the heat produced by an average resting man would suffice to raise nearly four gallons of ice-cold water to boiling-point. That sounds like a tale from Ripley, but it is true.

It will be obvious to you, of course, that a body not at rest, but doing work, must produce a great deal more heat than this. Under the very best conditions a muscle wastes three times as much heat as the energy it puts into the work it does; and muscles very seldom work under anything approaching the best conditions. A navvy produces about two and a-half times the amount of heat in twenty-four hours that the resting man produces. During the actual working period, of course, the ratio is very much greater. Not only does deliberate work speed up heat production, but other acts assist the process. The act of eating and the activities set in train thereby must increase heat production. This is particularly the case when a great deal of protein foods (meats and some cereals) are taken. Stimulating substances such as alcohol must, of course, entail increased heat production.

The whole of life, therefore, is inescapably bound up with the production of heat, which varies from a moderate level to fierce peaks of intensive activity.

2. How the Body Loses Heat.

Fortunately for us, and for life in general, the living body not only produces heat but it loses heat from itself to other objects. It can readily do this, of course, if its surroundings are cooler than itself, and the more readily the greater the difference. If the climate is a very cold one, the body loses heat so rapidly that it would rapidly die if measures were not taken to hinder the loss by warm clothing, fires, &c. With moderate differences, the body feels comfortable, i.e., with moderate clothing it is losing heat just about as rapidly as it is producing it without worry or strain to its myriads of contained activities. When the differences in temperature are small, however, then it is difficult for the body to lose heat as rapidly as it produces heat, and the body temperature is in danger of rising. Man, fortunately, is in a much better position than inanimate objects and in a much better position even than lower animals such as the frogs. Man can adjust the rate at which he loses heat to suit his surroundings. By throwing more blood into his skin blood-vessels he makes the skin warmer and thus able to get rid of heat more quickly. But his most valuable possessions in this respect are his sweat glands. No other animal, with the possible exception of the horse, has such well-developed and active sweat glands as has man. When loss of heat by ordinary physical channels is denied to him, man can still lose a considerable amount by producing sweat and allowing it to evaporate from his skin surface. This evaporation requires two things for its success—a reasonable dryness in the air and free circulation of air. The more humid the air the greater the need for free air movement; the drier the air the less movement required. Anything which interferes with the process of evaporation in hot climates—humidity, heavy and tight clothing, air stagnation—increases the difficulties experienced by the body in losing heat, and calls for appropriate remedy.

In illustration of the very important part played by the sweat glands, the experiences of certain unfortunate people who, by some freak of development, did not have any sweat glands are important. These people, if called upon to work in the fields, had to take with them buckets of water with which they damped their clothing every so often. If they failed to take this precaution they quickly suffered all the effects which we associate with an undue rise of body temperature. The horse sweats profusely when exercised on a hot day. Sometimes, particularly in India and Malaya, horses fail to sweat, and if played in a polo game die from heat stroke. Similarly, men working in hot desert country depend for their very existence upon the power of sweating, and if sweating is stopped by certain diseases or other causes heat stroke is almost inevitable.

Some heat, it is true, is lost by evaporation of water from the lungs into the inspired air. In the dog this may be of tremendous importance, since that animal, unfortunate in not being able to sweat, is fortunate in having a large, moist tongue over which he can move by rapid but shallow panting large amounts of air and secure rapid evaporation. In man, however, any advantage to be gained by more rapid breathing is of theoretical value only, and can make little difference to his heat loss.

3. The Importance of Body Temperature.

If the temperature of any living tissue is lowered the active processes we call life are slowed; if the temperature is raised they are hastened, but, most unfortunately, not only are the life processes hastened but the

destructive are hastened also, and, indeed, if the temperature rises much above 104 deg. F. the destructive processes start to take charge, while at 108 to 109 they are in complete control and the tissue dies. Man is equipped with the most complex and most sensitive systems in the animal series for keeping his body temperature steady under the widest variety of circumstances. This is another instance for Mr. Ripley—a man can stay in a perfectly dry atmosphere at 250 deg. F. (38 deg. above boiling point) for fifteen minutes without harm, while a beef-steak is partially cooked under the same circumstances in thirteen minutes. Undoubtedly such an exposure could not be maintained much longer than fifteen minutes, but it illustrates the enormous powers man possesses for combating the effects of temperature in his surroundings.

Only those who boldly pry into nature's secrets can appreciate the complexity and nicety of the shifts employed by the human body to keep its temperature constant. Heat production on the one hand has to be balanced against heat loss on the other, so that the balance in hand is always reasonably constant. The plan of action adopted by the body might not meet with the unanimous approval of economists, in that it attempts to exercise but little control over production—and that little is often flouted. To a certain extent the lassitude and reduction of appetite which accompany hot weather, particularly at its onset, are protective by diminishing heat production, but they are, I fear, largely accidental, and any good result achieved is easily wiped out by a small rise in body temperature. The body seeks rather to control heat loss, speeding this up by various means until the loss is restored to its normal level. It is easy, of course, to conceive surroundings in which adequate heat loss could not possibly be kept up (e.g., a still, saturated atmosphere of 97 deg. F.), but, very fortunately for man, such climates are practically non-existent under natural conditions.

This marvellous regulation of body temperature is not conducted, however, without expense to the body or its efficiency. Long before the critical level is reached, the adjustments the body is called upon to make, such as throwing more blood into the skin areas at the expense of the nervous system and internal organs, have their effect upon various bodily functions. It is wise, therefore, to reduce the strain thrown upon the heat-regulating mechanism to reasonable proportions. No careful car-owner throws the maximum burden on to its mechanism except in emergency, nor does he continuously impose a heavy strain upon it.

4. Helping the Body to Keep Cool.

Once we understand the general methods adopted by the body for keeping its temperature constant in hot weather, and the necessity for its continued success in this work, the rules for behaviour in hot weather are largely common-sense applications.

The first and most obvious course to adopt is to avoid the heat as much as possible by keeping in the shade and avoiding artificial sources of heat. It seems ridiculous to mention this, but the obvious is not always completely met. A good deal more could be done to shade the footpaths in our tropical streets, while anyone who knows the average conditions in the tropical kitchen will allow that there is vast room for improvement. A tiny kitchen with low, unceiled roof and unlined walls, often built on the sunny side of the house, containing a large, naked, iron stove with a flaring wood fire, and grossly ill-ventilated, is surely a manifold flouting of the obvious.

One often hears a controversy as to the relative merits of free ventilation on the one hand and insulation on the other in reducing the effects of hot climates. Like so many perpetual controversies, it has no real point, since the conditions calling for the one or the other are quite different. In this respect it is amusing to find our highly developed scientific intelligence coming to conclusions which have been put into empirical practice for thousands of years. From the dawn of history, almost, the inhabitants of the hot, arid regions have relied upon insulation, both in personal clothing which consists of voluminous loose robes, and in architecture, which utilises massive walls and narrow apertures closed against the heat of the day. The dry air permits of evaporation at a rapid rate with a minimum of air movement, and, indeed, the increased incidence of hot air from without only serves to render the body's difficulties in getting rid of heat more acute. On the other hand, the native dwellers of tropical coasts and humid forests reduce their clothing to a minimum and erect dwellings which are the acme of airiness. The air is relatively so full of moisture in these regions that it rapidly becomes saturated, and if evaporation is to continue new air must be constantly supplied. Empirical practice is well confirmed by scientific treatment; insulation is the key principle in hot, dry climates, ventilation and air movement in hot, wet climates—and yet we treat tropical Australia as though one rule will serve equally well in all parts.

Physical activity in hot weather is a matter of careful adjustment to each person's circumstances. Excessive activity must, of course, be avoided, but some people can stand up to a great deal more than others. Avoidable activity is best restricted to the cooler portions of the day. On the other hand, the habit of laziness is fatally easy of acquirement, and is as detrimental to physical health as it is to spiritual value. A deliberate devotion to moderate exercise is an essential part of the daily routine for a sedentary worker. Deliberate combating of lassitude is a great aid to maintaining efficiency, and to keep going is often to improve one's feelings of fitness. There are, of course, limits to this procedure, to overstep which would be foolish.

Mental activity requires as much drill as the physical. The attempts to maintain body temperature probably detract from the normal blood supply of the nervous system and produce the mental sluggishness characteristic of hot weather. This is remedied by acclimatisation, and the remedy is aided by physical fitness. The lapse into mental sloth is insidious but real, unless active steps are taken to forestall it. If efficiency is to be maintained, this must be done. Mental inactivity as much as over-worry is a precursor of "tropical" neurasthenia.

Dietary regulations can play a useful part. A certain reduction in protein foods and their replacement by fresh fruits and green vegetables is a good rule. It is very doubtful if vigorous stimulation of appetite by spices and sauces is justifiable. Salt is a very necessary condiment, particularly in hot, dry regions, to replace that lost in the sweat. Stimulating drugs such as alcohol should be reduced to a minimum and confined to the cooler times of the day. Copious supplies of water are essential to replace sweat-loss. The Coolgardie cooler, or, better, the ice-chest, or, better still, the refrigerator is probably the most important fitting in the kitchen in providing cool, appetising food, and in keeping it without the destructive processes of preserving.

The application of common-sense principles in such a way as to maintain a reasonable balance amongst the different bodily requirements, yielding place to no particular fad, will do much to relieve the strain imposed by hot weather.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

Prickly Poppy.

A.J.C. (Yeppoon)—

The specimen is the prickly poppy, *Argemone mexicana*, a native of Mexico and tropical America, now spread very widely as a weed over many warm countries. It is common in Queensland, and local names given to it include Californian thistle and silver thistle. It is not a real thistle, but a member of the poppy family. It is reputed to be poisonous to stock, but in addition to its prickly nature, it has an intensely bitter sap which makes it unpalatable and it is very rarely eaten. The only cases of reputed poisoning which have come under our notice have occurred when it has been cut and left to dry, and the subsequently softened plant eaten by calves.

Net Fungus.

V. J. W. (Pittsworth)—

The specimen represents a species of *Clathrus* or net fungus. The offensive smell of this fungus is caused by slimy matter on the inner face of the net. Carrion-feeding insects, such as flies, are attracted to this. It contains the spores, and they are carried away on the feet of the insects. The plants are not very common, and are very short-lived.

Paterson's Curse.

G.R.S. (Biggenden)—

The specimen has no flowers or fruit, but it is evidently the glue weed or Paterson's curse, *Echium plantagineum*. This is a native of the Mediterranean region of Europe. In New South Wales, it is a fairly serious pest in cultivation areas. It may be as well to get rid of it where it appears in cultivation here, as it is a very strongly-growing plant. At the same time, it does not appear likely to become such a pest on our coastal country, as it is further south. It is not harmful to stock; as a matter of fact, in its young stage it is reputed to be good fodder.

Whitewood.

H.F.R. (Longreach)—

The specimens have been identified as the whitewood, *Atalaya hemiglauca*. The foliage of this tree has been fed to stock for quite a long time. Some years ago it was accused of being the cause of "walkabout" disease in North Australia, and it was claimed that feeding experiments had produced the symptoms. Some analyses made at that time showed that the young shoots and younger parts contain saponin. This saponin content may possibly be the attractive agent in the palatability of the leaves of this tree.

Scarlet Pimpernel.

E.D.W. (Cooroy)—

The specimen is the pimpernel or scarlet pimpernel, *Anagallis arvensis*, a native of Europe and now a naturalised weed in most temperate countries. It is a very common weed in parts of Queensland during the winter and early spring months, but usually dies off on the approach of the hot weather. The present time should be a good one to chip out or eradicate the plant, as probably it has not yet started seeding. Later on, it will be a mass of seed. If the area is too large for chipping out, there is no known method of eradicating it other than by chipping, hand-picking, and poisoning, and we think the thing is to get the weed at the right stage, and the present time should be a favourable one, particularly for poisoning.

General Notes

This Month's Cover.

This month's cover block is from a photograph by Mr. A. Groom, Binna Burra.

Staff Changes and Appointments.

Mr. T. G. Mann (Proserpine) has been appointed millowners' representative on the Proserpine Local Sugar Cane Prices Board, *vice* Mr. R. Shepherd, deceased.

Mr. R. W. Peters, Experimentalist, Cotton Section, has been appointed Research Officer, Agricultural Section, Division of Plant Industry (Research), Department of Agriculture and Stock, and Mr. S. Marriott, B.Sc.Agr. (Queensland), Assistant Plant Breeder, Queensland Agricultural High School and College, has been appointed Assistant Research Officer, Agricultural Section, Division of Plant Industry (Research), Department of Agriculture and Stock.

The following Border gatekeepers for the New South Wales Department of Agriculture have been appointed also inspectors under the Queensland Diseases in Plants Acts for the purpose of inspecting consignments of potatoes entering Queensland from New South Wales *via* the Border crossings:—

Messrs. F. W. Avery (Killarney), E. C. Onions (Sugarloaf), J. C. Sabine and G. Allen (Stanthorpe), (Mrs.) F. E. Heydon, E. L. Carpenter, and J. V. Boxwell (Wallangarra), H. Blake (Mount Lindesay), S. J. Graves and L. E. C. Scott (Texas), and V. I. Spalding (Goondiwindi).

Messrs. R. H. MacKay and R. F. Young, of "Stuartdale," Ripley, Ipswich, have been appointed honorary protectors under the Fauna Protection Act.

Mr. F. H. Stevens, Homebush road, Mackay, has been appointed canegrowers' representative on the Racecourse Local Sugar Cane Prices Board for the remainder of the present sugar season, *vice* Mr. A. Turner, resigned.

Council of Agriculture.

A Regulation has been issued under the Primary Producers' Organisation and Marketing Acts prescribing the members who shall represent commodity boards on the Council of Agriculture. These are:—Messrs. J. McRobert (Maryborough) and W. J. Sloan (Malanda) (Butter Board); D. G. O'Shea (Southbrook) (Cheese Board); H. F. Lindenmayer (Mundubbera) (Cotton Board); L. R. Crouch (Atherton) (Atherton Maize Board); C. Brumm (Woongoolba) (Arrowroot Board); R. V. Woodrow (Woodford) (Honey Board); E. Fitzgerald (Felton) (Barley Board); O. A. W. Evans (Warwick) (Egg Board); H. Zischke (Hatton Vale) (Broom Millet Board); W. A. Ross (Macalister) (Canary Seed Board); C. W. Roseblade (Yungaburra) (Northern Pig Board); P. J. Savage (Brookfield) (Committee of Direction of Fruit Marketing); G. Johnson (Mirani) (Queensland Cane Growers' Council); W. J. Brimblecombe (Pirrinuan) (Wheat Board); G. A. Duffy (Chairman, Timber Advisory Board) (Plywood and Northern Plywood Boards).

The Regulations under the abovementioned Acts have also been amended to provide that the annual conference of the Council of Agriculture shall be held on such date after the close of the financial year as shall be fixed by the Executive Committee of the Council with the approval of the Minister.

Banana Industry Protection Board.

A Regulation has been issued under the Banana Industry Protection Acts providing that, in lieu of election, the growers' representatives on the Banana Industry Protection Board shall be nominated by the Committee of Direction of Fruit Marketing from the Banana Sectional Group Committee. This action has been taken in recent years, the nominees holding office for a period of one year. Messrs. M. Buchanan (Gympie) and W. J. Branch (Russell Island) have accordingly been nominated by the C.O.D. from the Banana Sectional Group Committee and have been appointed growers' representatives on the Board until the 30th September, 1939. The Government representatives on the Board are Messrs. R. Veitch (Director, Division of Plant Industry (Research)) and H. Barnes (Director of Fruit Culture).

Tableland Maize Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts amending the constitution of the Atherton Tableland Maize Board in relation to the delivery of maize to such board. At present it is prescribed that the conditions of delivery of maize shall be fixed by a notice approved by the Minister published in any newspaper or newspapers circulating in the district. This provision has been deleted.

Rural Topics

Feeding of Concentrates.

Farmers are often averse from feeding concentrates, which impart a flavour or ''taint'' to the butterfat. Peanut products are a typical example. In many cases the difficulty may be overcome by feeding the material immediately after milking. The animal then is assured of sufficient time, before the next milking, in which it can utilise the constituents which give the off flavour.

Tar Branding of Sheep.

Some stockowners still persist in using a tar brand on sheep, apparently without realising the loss which this practice entails. Wool from tar-branded sheep is often sold at a lower price than wool marked with one or other of the several recognised branding fluids, which are harmless and easily emulsifiable. Tar spoils the wool, from which it is very difficult to remove during the process of manufacture.

The grazier, who uses tar for branding should, obviously in his own interest, discontinue the harmful and costly practice. Furthermore, the practice is illegal.

Feeding Farm Horses.

It is not unusual to see a farm hand pitchfork hay into a yard over which manure is thickly scattered. This is a source of loss and risk. Much of the hay is trampled into the dust or mud and rendered unusable. Even ensilage may be wasted in this way. A far greater, although more indirect, loss to the stockowner is caused by the contaminated feed. Many farm horses are infested with worms of various kinds, and dirty yards may teem with the parasites in their initial stages. These get into hay, or other feed tossed on to the ground, and are swallowed by stock, often with disastrous results. Deaths among farm horses have been traced to worm infestation, and owners will find it worth while to take great care in feeding their working animals. A rack or a trough ensures greater cleanliness and saves waste of good feed.

Dairying and Lamb-raising in New Zealand.

In New Zealand in recent years shortage of farm labour has caused, either wholly or in part, certain variations from routine practice on what were formerly entirely dairying areas. One of these changes has been the introduction of breeding ewes and the practice of fattening store lambs in partial substitution of some of the dairy stock.

Pasture Improvement.

Down in Victoria, experimental work is being done to ascertain how far New Zealand methods and practices in pasture management would be beneficial under the conditions in that State.

New Zealand farmers increase the stock-carrying capacity of their pastures by means of increased fertilizer treatment, intensive rotational grazing methods, the sowing of leafier and more prolific pasture grasses and clovers, grass topping, frequent harrowing to promote soil aeration, the spreading of animal droppings, and the use of nitrogenous fertilizer to stimulate out-of-season growth. From the results recorded, however, it is apparent that the building up of soil fertility by the use of superphosphate must be the basis of all pasture improvement in southern Victoria.

The Pig Parade at the Show.

For those who could not watch the judging, the pig parade at the Brisbane show provided the only opportunity of seeing the prize-winners in such a way that they could be satisfactorily compared. It would be a good thing, however, if the breeds were paraded separately in groups. There are plenty of people who are interested in more than one breed, and if the parades were at intervals of, say, ten minutes or a quarter of an hour, it would be better for the spectators from every point of view.

Roots Low in Vitamins.

Root crops, with the exception of carrots, are very low in vitamins A, B, and D, so that when they form a large part of the pigs' diet, care should be taken to have good pasture available, or to feed an allowance of yellow maize.

Orchard Notes

NOVEMBER.

THE COASTAL DISTRICTS.

Citrus Fruits.

In the citrus orchard the increase in temperature and the possibility of a dry period call for the utmost attention to soil conditions, particularly aeration and moisture conservation. At the slightest sign of distress, owing to lack of moisture, trees should be irrigated thoroughly whenever water is available for this purpose.

At the same time care and attention should be given to cultivation, particularly on hillside orchards, and in the coastal districts the possibility of the approach of storms will prompt growers to consider the completing of each cultivation by forming shallow drains to care for excess water and prevent soil losses.

Attention must be given to the incidence of mites, which are the direct cause of the darkening of the skin of the fruit known as "Maori." Usually the first indication of the trouble is when, with the sun shining on it, the fruit has the appearance of being covered with a grey dust. If examined with a good lens, the skin will be seen to be covered with numerous yellow slug-like insects which are living on the skin.

Under certain weather conditions scale movement may be expected.

Detailed information regarding insect control may be obtained from the Department publications on the subject.

Pineapples.

Continue planting pineapples as discussed in these notes last month, always remembering that the modern practice is smaller areas, close planting with more pineapples per acre, quicker, better and more healthy growth, and finally better fruit by liberal fertilising through the leaf bases with 10-6-10. Taken all together, these recommendations tend towards the elimination of wilt.

Bananas.

New Plantings.—November and December are very suitable planting months in most districts. Just as modern methods have effected great improvements in pineapple culture, so they might be applied in principle to banana growing. Smaller areas and large production per acre should cut overhead costs and lighten labour, lengthen the profitable life of the plantation, and reduce the time of waiting for the crop. To this end select planting material with care, plant in large holes, and break up the ground as soon as possible after planting. To prevent the loss of top soil by erosion and to provide the bananas with a cooler and moister environment, plant a cover crop as soon as weather permits, and initial weed growth has been suppressed. This will hold the loose surface soil during the summer rains.

Young Plantations.—The correct follower or followers for each plant should be selected, if not already done, and all additional suckers suppressed. Cultivate to conserve moisture and mulch with a cover crop. A complete fertilizer will improve the coming crop.

Old Plantations.—De-sucker to one follower to each plant. Apply a complete fertilizer, if not already done, and cultivate to conserve moisture.

General.—Bait for borers; be prepared for caterpillar plagues; watch for bunchy top.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

KEEP the orchards and vineyards in a thorough state of cultivation, so as to keep down all weed growth and conserve moisture in the soil. This is important, as if a long spell of dry weather sets in, the crop of summer fruit will suffer severely from the lack of moisture. Citrus trees should be irrigated where necessary, and the land kept in a state of perfect tilth. Spraying for codling moth should be continued, and all pip fruit trees must be bandaged by the beginning of the month; further, the bandages must be examined at frequent intervals and all larvæ contained in them destroyed. The neglect to spray thoroughly and to attend to the bandages

properly is responsible for the increase in this serious pest in the Granite Belt, and growers are warned that they must pay more attention to the destruction of this pest if they wish to grow pip fruit profitably. Fruit fly may make its appearance in the cherry crop; if so, every effort should be made to stamp out the infestation at once, as, unless this is done, and if the fly is allowed to breed unchecked, the later ripening crops of plums, peaches, apples, pears, apricots, and Japanese plums are bound to become more or less badly infested. Combined action must be taken to combat this the most serious pest of the Granite Belt, and growers must realise that, unless they take this action and see that careless growers do not breed the fly wholesale, they will never keep it in check, and it will always be a very heavy tax on their industry. A sharp lookout must be kept for brown rot in fruit, and, on its first appearance in a district, all ripening fruit should be sprayed with lime sulphur 1 in 120.

All grape vines, potatoes, and tomatoes should be sprayed with Bordeaux or Burgundy mixture as required for the control of downy mildew and anthracnose of the grapes, and Irish blight and target spot of the potato and tomato.

ANGLO-AUSTRALIAN TRADE TALKS.

There may have been some disappointment at the outcome of the talks with Australia, but the months spent in the discussions cannot be considered wasted when a document of such wide scope and significance as the resulting Government White Paper is the outcome. The "Memorandum of Conclusions" constitutes a valuable compromise. It is recognised that Australia has a vital interest in the United Kingdom as the greatest market for her exports of primary products. The United Kingdom, similarly, has a vital interest in Australia as one of the greatest customers for British goods and as the domicile of the largest amount of British capital invested in any single overseas country, and as a field for future investment. It would seem that for the first time the two Governments have got down to bedrock and have succeeded in drawing up a statement of general principles, which should do much to facilitate future negotiations. Therefore, although no new trade agreement has been made, there has been a definite clearing of the air in the realms of defence, foreign policy, and the general principles of economic relationship. Pending further inquiry and a probable return of the Australian delegates, the existing agreement will remain in force.—*The British Trade Journal and Export World.*

Farm Notes

NOVEMBER.

WHEAT harvesting will become general during November, so that header-harvesters, tractors, and other equipment utilised, should be placed in thorough working order.

Modern machinery is efficient, but should receive adequate lubrication and periodic adjustment in order to avoid stoppages at a critical stage.

The menace of rust does not assume serious proportions now that the bulk of the crop is derived from the moderately rust-resistant "Three Seas" and "Seafoam," together with varieties such as "Flora" and "Florence," which usually mature sufficiently early to escape rust.

November is regarded generally as the best period for the establishment of the main maize crop, because the tasselling period coincides usually with normal summer rains. Too much attention cannot be given to the preparation of land intended for maize, preparation which should now be in an advanced stage, as no amount of into-row cultivation will overcome the retarding influence of faulty initial preparation.

Inter-row cultivation should become progressively shallower as growth proceeds, and may be discontinued at the cobbing stage. Increased attention is being given to the growing of grain sorghums, chiefly in districts where the rainfall is insufficient to assure profitable yields from maize. Instances are on record of yields up to 12 bags per acre being obtained under conditions which were fatal to maize, while the ability of header-harvesters to successfully harvest the new dwarf-growing varieties is a big factor in economical production. Seed supplies of suitable varieties are apparently difficult to secure at present, but should become adequate in the near future.

For intermediate or catch crops, the rapidly maturing millets, Japanese millet and white panicum, can be recommended for present sowing, being suitable for grazing, silage, or hay. If seed production is desired, preference should be given to the variety known as "Giant Panicum" or "Giant Setaria," and to the French millet.

Local potatoes and onions will now be reaching the market, and in order to obtain the best possible returns, attention should be given to grading, and to marketing in sound, clean, or preferably new bags.

To retard infestation by the potato tuber moth, the potatoes should be bagged, sewn, and removed from the field with a minimum of delay, as if exposed overnight, some infestation may result during storage. Do not cover with potato tops.

The planting of peanuts will be continued in the main South Burnett districts, where Virginia Bunch and Red Spanish are the principal varieties.

Growers are reminded of the better germination obtained where seed is treated with the fungicide "Ceresan" before sowing.

In addition to the crops mentioned above, seasonal sowings of Sudan grass, broom millet, buckwheat, pumpkins, melons, &c., can be made, and cow cane and sweet potatoes planted out.

Where broom millet is grown as a sideline, it is sometimes preferable to make small succession sowings in order to spread the harvesting over a longer period.

THE BOY ON THE FARM.

At an agricultural conference in South Australia recently a farmer who introduced the subject thought that farmers' sons were not given sufficient responsibility, and he suggested that they should be given a definite share in the work of the farm and be expected to undertake it on their own initiative. This might give the necessary stimulus and help to keep boys on the farm. "If the Australian farmer's son is encouraged a little," he said, "there will not be the cry of 'Back to the Land!'"

Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THREADWORMS.

BABY clinic nurses receive many inquiries regarding the treatment of threadworms. Recently a mother called at the clinic to secure advice about her child aged twelve months who was passing these worms. She said that she had an older child aged four years who had been suffering from worms for years. She had taken him to several doctors and although she had carried out various forms of treatment she had not succeeded in curing him; in fact, she had given up trying to get rid of them. Another wrote stating that she had two small children who were causing her a good deal of worry on account of worms. The older boy, aged three years, had been troubled for some months and she had been unable to secure satisfactory advice. Acting upon her doctor's instructions she had given him salt injections and some powders. This treatment had brought away large numbers of worms, but after two courses spread over a period of two months, he was still passing large numbers. The mother stated that she felt very discouraged and wanted to know what else she could do. She was feeling anxious about the younger child who was a year old, and wanted to prevent the trouble arising in his case, if possible. She added that she looked after the children herself and had been particular in giving them the diet advised by the doctor and had been very careful to withhold sweets of all kinds.

We sympathise with mothers such as these who are taking great trouble to manage their children to the best of their ability and knowledge.

Threadworms occur quite commonly in children and in many cases are associated with an unhealthy state of the bowel. They produce itching and irritation and are often associated with a poor or a capricious appetite, restlessness, irritability, and sleeplessness.

Predisposing Cause.

It has been said by a world-renowned specialist in children's diseases that worms are a symptom of disease and not a disease in themselves. They are a symptom of a form of indigestion or disorder of the bowel known as mucous disease in which there occurs in the bowel an excessive secretion of mucus which forms a good medium in which the worms can live and feed and lay their eggs. This condition is often associated with malnutrition and the child appears pale and wasted. While in some cases the appetite is poor, in other cases the mother will tell you that although the child eats a great deal he does not seem to gain weight. In some cases the child has the desire to eat such things as dirt or cinders. Constipation is often present and the motions usually contain a clear Jelly-like substance as well as worms. Such a child may suffer from "wetting of the bed at night." Occasionally there is a history of the child turning suddenly pale at intervals. Frequently a short irritable cough occurs. One frequently exciting cause of mucous disease is the excessive consumption of sugar.

General Treatment.

In the first place it is necessary to treat the unhealthy state of the bowel. This is done by paying attention to the child's food. Sweets, sugar, and cakes must be avoided and a restriction placed on starchy foods; otherwise the child is fed according to the diet recommended for his age. He is encouraged to live out of doors in order that he may get as much fresh air, sunlight, exercise, and sleep as he requires.

Special Treatment.

As the child may become infected by swallowing earth or rubbish containing eggs of the worms or by contact with another infected child, care must be taken to protect him from these sources of infection. The worms reach the lower part of the bowel where the female deposits her eggs. The wriggling of the worms produces irritation and itching in the region of the anus or back passage. The child scratches himself particularly at night time and the eggs become transferred to his fingers and lodged under his nails and are carried to his mouth. It is necessary, therefore, to wash the child's hands and clean his finger-nails particularly before meals and before going to bed; otherwise the child will reinfect himself. Mere clearing out of the worms is of little use, unless this reinfection is prevented. The region round the anus must be well washed after each motion and smeared with an ointment. He should be clothed in a garment which will prevent his fingers from coming into direct contact with the anal region.

Expulsion of the Worms.

On the first day the child should be given a simple light diet. This consists of bread baked in the oven, milk and water and fruit juice, avoiding porridge, biscuits, pastry, jam, and sweets of all kinds. In the afternoon the worms are driven down into the lower part of the bowel by giving a full dose of castor oil. When this has acted the bowel should be emptied by an injection of about 1 pint of warm water. This should be injected slowly and retained as long as possible.

On the second day no food should be allowed, but as much boiled water as possible given. Administer a powder prescribed by a doctor.

On the third, fourth, and fifth days give a daily warm bath and an enema of warm water followed after the bowels have acted by an injection of about one breakfast cupful of warm water and salt (one teaspoon to 1 pint).

The child may be given a simple light diet on the third day and a return made to a normal diet by the sixth day.

The chance of reinfection must be kept always in mind. Careful attention must be paid to the diet in order to avoid a recurrence of the unhealthy state of the bowel. Milk, meat, fish, eggs, butter, vegetables, and fruit may be given acording to age, and a minimum amount of sugar.

It may seem to some that the instructions given involve a great deal of time and trouble for the curing of such a trivial ailment, but the distress that threadworms and the conditions associated with them may cause the sufferers and the anxiety they may cause those are are in charge of the children affected, justify the time and trouble necessary.

It follows from what has been said that the infected child should not be allowed to play with other children or their toys until he is cured. Bed clothes, towels, &c., should be kept separate. Other members of the family should be examined and treated if necessary.

IN THE FARM KITCHEN.

FACTS ABOUT THE PAPAW.

The papaw tree takes a prominent place among the many tropical fruits that thrive in Queensland. The papaw originally came from Central America and is known there by the natives as the "papaya" or "mamai" (father and mother) tree, according to the sex of the plant. Introduced many years ago, the papaw gradually became acclimatised until it found conditions so congenial that it now thrives throughout the coastal areas of Queensland.

Papaw trees grow from seeds. The tree is a small one seldom exceeding 20 feet in height, is of spongy texture and is usually hollow in the middle. It is practically branchless, and is surmounted by a crown of large palmate leaves, at the base of which fruit is produced.

The male tree flowers profusely, bearing flowers at the end of long stems which hang down and suspend vertically any fruit if formed. As the fruit borne by male trees is small and of no commercial value, the trees are usually cut out as soon as the sex can be determined, a few only being left for purposes of fertilization of the seeds in the fruit of the female trees.

The female tree bears flowers at the base of the stem of each leaf and a profusion of fruit forms close to the stem. The fruit are often so thick on the stem of the tree that many of the papaws are crushed as they develop, and ripen in a mis-shapen condition.

The papaw tree, being of tropical origin, is particularly liable to damage from frost, and must be grown in positions sheltered from heavy winds and frost.

Seeds are planted in beds in the spring and early summer, and the small seedlings transplanted to the field when from 6 to 12 inches in height. In order to make full allowance for the cutting out of the male trees, two and at times even three seedlings are planted to each stool, but of these not more than one tree is allowed to bear fruit. Trees are spaced from 8 to 10 feet square. The young plant develops rapidly and, given suitable growing conditions, the female will at times commence to bear fruit within 2 feet of the ground. Particularly vigorous trees will at the one time have from 4 to 6 feet of the stem literally covered with fruit. Trees will bear in approximately twelve months, and although their commercial bearing life is short, seldom exceeding four years, the actual weight of fruit produced per tree is high. The fruit ripens from the base upwards, and no part of the stem ever bears more than one crop. As the tree ages the fruit is developed higher and higher from the ground, and it is a common sight to see branchless trees so high that ladders must be used for picking.

The skin of the papaw is very thin and particularly delicate when the fruit is fully ripe. The thinness of the skin makes it pecularly susceptible to outside influences, and accounts for so many of the ripe papaws showing blemishes. These, however, do not detract from the eating quality of the fruit.

Production.

Gradually the health-giving properties of the papaw are receiving wider recognition, and the acreage under papaws is increasing. The papaw is grown at Sunnybank, Manly, Aspley, and Brookfield (districts within easy reach of Brisbane), Woombye, Yarwun, and other North Coast centres, and in North Queensland. So popular is this fruit in Queensland that numerous householders grow a few trees to meet their own requirements.

As a table fruit the papaw is delicious and wholesome. Some palates may not appreciate the flavour at first, but the papaw habit is well worth acquiring in such cases. The addition of a little orange or lemon juice or passion fruit greatly improves the flavour. For salads, papaws are especially valuable. The size of fruit varies on each tree, but most fruit marketed will provide from 1 to 5 lb. of succulent flesh, which, by the addition of sliced oranges and pineapples, quickly makes a delightful salad, and one that will allow generous helpings. Papaws are in season from April to December.

Papaw Uses.

The papaw is used in various forms:

(*a*) In its ripe state as a breakfast fruit, for which purpose it is cut lengthwise into individual portions, and the seeds are removed. It is flavoured to suit the taste by the addition of lemon or orange juice and sugar—or with sugar only.

(*b*) As a dessert fruit when it is sliced and eaten with sugar and crushed ice, or diced and incorporated with other fruits as a fruit salad.

(*c*) As a salad combined with lettuce or in mayonnaise; or served with green celery and onions.

(*d*) The green fruit may be boiled or baked and served as a vegetable.

(*e*) As a crystallised fruit, and it is sometimes made into pickles, marmalade, jelly, pie, jam, ice-cream, and sherbet.

(*f*) As the main constituent of the following commercial lines; Tropical fruit salad and papaw chutney.

Nearly all parts of the papaw have some medicinal value. The most important medicinal properties are said to be found in the milky juice which occurs most aboundantly in the green fruit. These properties of the juice are due to the active principle called "Papain," which has been long recognised as of considerable value in dyspepsia and kindred ailments. Its digestive action is undoubted, and it is a not uncommon practice to rub a slice of green juicy papaw on tough meat to make it tender. Another practice is to wrap the meat in crushed papaw leaves over-night preparatory to cooking it.

The papaw is a valuable aid to digestion, and many sufferers from dyspepsia have obtained relief by eating this fruit. Papaw juice contains papain, a powerful digestive ferment, which is often used instead of pepsin. The seeds have the flavour of watercress and are an efficient vermifuge.

Papaws contain no sucrose, but contain laevulose, which is specially suitable for diabetics.

PAPAW RECIPES.

Papaw Preserve.

Take 1 lb. of sugar, ½ pint of water, to make a syrup, 2 tablespoonfuls of lime, and a gallon of water. Put the lime into the water, and stir until dissolved; peel the fruit, and cut into slices about 2 inches thick and the length of the fruit. Put these pieces into the lime water and allow to remain for about 8 to 10 hours; then taken the fruit out, make the syrup, and when boiling put in the papaw; boil quickly for half an hour; take out the fruit and arrange lengthwise in a glass jar. When the syrup is cool, fill the jar and cork down tightly.

Fruit Salad.

Take as many different fruits as possible—oranges, papaws, pineapples, apples, bananas, passion fruit, and the juice of a lemon. Cut bananas into thin slices, and papaws and pineapples into cubes, peel the apples and slice them in. Remove pith from oranges and slice them in. Sprinkle each alternate layer with sugar, squeeze over the juice of the lemon and the passion fruit. Serve with whipped cream.

Mixed Fruit Jelly.

Take 2 large apples, 3 bananas, a nice piece of papaw, a small piece of pineapple, and any other fruit you like. Cut it all up in nice fine slices, squeeze passion fruit all over the top, sweeten a little, then make a pint of jelly, and when fairly cool, pour over the fruit. This can be eaten with whipped cream or custard or served plain.

Papaw Dessert.

Cut up in rather large pieces, put in enamelled stewpan with about a pint or so of water to 3 lb. of fruit, 1 small teacupful of sugar, the juice of 2 lemons, bring to the boil and simmer for 10 minutes, set aside to cool, and serve with a milk pudding, or it may be set in jelly.

Papaw Salad.

By adding a little orange or lemon juice to diced or mashed papaw you can produce a lovely salad in a few minutes. This is the most inexpensive fruit salad possible and is simply delicious.

Tropical Fruit Salad.

Papaws, bananas, and pineapple combine to make a delicious tropical fruit salad. Use in quantities to suit taste, dicing the papaw and pineapple and slicing the bananas. Crush a little of the pineapple to secure juice and sprinkle this over whole with a little sugar, and serve.

Icy Fruit Slices.

Cut a papaw into sections lengthwise, sprinkle with lemon and sugar, and place in ice chest until thoroughly cold. When serving sprinkle with crushed ice if desired.

Crystallising Fruits.

Choose good sound fruit, not too ripe, and prick with a needle. Place in a pan of cold water and bring to the boil. The fruit will rise to the surface, and must be lifted out and placed carefully in cold water. Prepare a syrup by boiling 2 lb. of cane sugar in 1 pint of water till on dipping a skewer into the syrup and blowing through it bubbles will be formed on the other side of the skewer. Then put the fruit into the syrup and boil up. Remove the scum. Take the pan off the fire and pour contents into a basin. Leave till the next day, then pour off the syrup and boil till it threads. Pour over the fruit and allow to stand overnight. Repeat the process for four days and on the fifth day boil the syrup to the "crack," dip the fruit into it and drain on a sieve in a warm place. Sprinkle with fine sugar. Pack carefully and keep in a cool dry place.

Papaw Tart.

One and a-half cups of self-raising flour, rub in 1 tablespoon of butter, add 1 teaspoon of sugar and a little salt. Mix with milk or water to make a light dough. Roll out thin, spread on a plate, prick all over, and fill with thinly-sliced papaw sprinkled with sugar and lemon juice or passion fruit. Cover with pastry and bake in a moderate oven.

Frozen Papaw Jelly.

Peel a firm fully ripe papaw, cut the end sufficiently to allow the removal of seeds. Dissolve jelly crystals, when cool pour into papaw cavity; place on ice and allow to set. Cut into rings and serve with whipped cream.

THE EMPIRE MARKET.

Some time must necessarily elapse before the full results of the Empire Producers' Conference in Sydney are felt. One important point is that both the British and Australian Governments have reached an agreement on the desirability of collective action by Empire producers' associations. One of the main objectives of the conference was to enable producers throughout the British Commonwealth to plan a long-range policy to ensure orderly marketing and stability of prices. It is believed that a sound foundation for future development has been laid, and, given the whole-hearted co-operation of producers throughout the Empire, a permanent and lasting policy is possible—a policy that will ensure to producers a price commensurate with costs of production and that will raise the standard of farming as a whole to a much higher level. In the Sydney resolutions there is the basis of a constructive policy which should be acceptable—at least, it is hoped so—to producers throughout the Empire; and, what is just as important, should gain for producers the sympathy and support of consumers.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF AUGUST, IN THE AGRICULTURAL DISTRICTS TOGETHER WITH TOTAL RAINFALL DURING 1938 AND 1937, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Aug.	No. of years' records.	Aug., 1938.	Aug., 1937.
North Coast.	In.		In.	In.
Atherton	0·89	37	0·98	1·31
Cairns	1·71	56	1·50	1·18
Cardwell	1·25	66	1·19	0·26
Cooktown	1·19	62	0·53	0·52
Herberton	0·63	52	0·63	0·42
Ingham	1·44	46	1·59	0·21
Innisfail	4·91	57	9·64	5·26
Mosman Mill	1·29	25	1·09	0·81
Townsville	0·49	67	..	0·01
Central Coast.				
Ayr	0·54	51	..	..
Bowen	0·63	67	..	0·05
Charters Towers	0·51	56	..	0·01
Mackay	1·01	67	0·27	0·31
Mackay Sugar Experiment Station	0·85	41	..	0·48
Proserpine	1·36	35	1·88	2·68
St. Lawrence	0·79	67	0·10	0·23
South Coast.				
Biggenden	1·07	39	1·89	1·11
Bundaberg	1·27	55	1·33	1·45
Brisbane	1·96	86	1·21	1·40
Caboolture	1·51	51	0·83	1·61
Childers	1·19	43	2·00	0·80
Crohamhurst	2·19	45	0·92	2·94
Esk	1·43	51	1·48	1·09
South Coast—contd.	In.		In.	In.
Gatton College	1·09	39	1·25	1·54
Gayndah	1·14	67	1·97	1·40
Gympie	1·70	68	1·55	2·26
Kilkivan	1·39	59	1·61	1·07
Maryborough	1·65	67	1·82	0·89
Nambour	1·88	42	0·74	3·20
Nanango	1·31	56	0·99	1·41
Rockhampton	0·81	67	1·41	0·29
Woodford	1·65	51	0·63	1·42
Central Highlands.				
Clermont	0·67	67	1·41	0·05
Gindie	0·62	39	..	0·22
Springsure	1·01	69	0·85	0·25
Darling Downs.				
Dalby	1·19	68	1·20	1·51
Emu Vale	1·09	42	1·52	2·49
Hermitage	1·15	32	..	1·89
Jimbour	1·14	50	1·18	1·20
Miles	1·10	53	2·92	1·41
Stanthorpe	1·77	65	2·27	3·43
Toowoomba	1·62	66	1·57	2·27
Warwick	1·44	73	1·72	2·90
Maranoa.				
Bungeworgorai	0·70	24	0·65	0·36
Roma	0·89	64	0·68	0·41

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—AUGUST, 1938.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·98	79	68	83	24, 25, 26	56	28	53	7
Herberton	..	71	52	84	25	40	26	63	4
Rockhampton	30·14	74	53	84	27, 28	44	2, 3	142	5
Brisbane	30·19	69	50	80	27	41	3	121	6
Darling Downs.									
Dalby	30·20	66	41	77	27	26	3	120	5
Stanthorpe	..	59	37	70	27	20	3	227	8
Toowoomba	..	62	42	73	15, 27	24	4	157	4
Mid-Interior.									
Georgetown	30·01	86	57	93	26	42	26	0	..
Longreach	30·12	77	49	93	27	36	9	51	1
Mitchell	30·18	68	38	86	27, 28	24	3, 4	66	3
Western.									
Burketown	30·01	84	60	95	26	54	10, 11	0	..
Boulia	30·10	77	49	94	27	39	8	0	..
Thargomindah	30·14	69	46	90	27	35	3	30	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	October. 1938.		November. 1938.		MOONRISE. Oct., 1938.	MOONRISE. Nov., 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·34	5·51	5·3	6·9	10·39	11·58
						p.m.
2	5·33	5·51	5·2	6·10	11·33	12·51
					p.m.	
3	5·32	5·52	5·1	6·11	12·24	1·45
4	5·31	5·52	5·0	6·11	1·16	2·42
5	5·29	5·53	5·0	6·12	2·8	3·35
6	5·28	5·53	4·59	6·13	3·2	4·33
7	5·27	5·54	4·58	6·13	3·56	5·34
8	5·25	5·54	4·57	6·14	4·53	6·36
9	5·24	5·55	4·57	6·15	5·48	7·40
10	5·23	5·55	4·56	6·15	6·48	8·42
11	5·22	5·55	4·56	6·16	7·49	9·40
12	5·22	5·56	4.55	6·17	8·50	10·31
13	5·21	5·56	4·55	6·18	9·52	11·21
14	5·20	5·57	4·54	6·18	10·52	..
						a.m.
15	5·19	5·57	4·54	6·19	11·46	12·5
16	5·18	5·58	4·53	6·20	..	12·45
					a.m.	
17	5·17	5·59	4·53	6·21	12·35	1·30
18	5·16	5·59	4·53	6·21	1·21	2·2
19	5·14	6·0	4·52	6·22	2·4	2·43
20	5·13	6·1	4·52	6·23	2·45	3·20
21	5·12	6·1	4·52	6·24	3·25	4·3
22	5·11	6 2	4·51	6·25	4·3	4·47
23	5·10	6·2	4·51	6·26	4·43	5·32
24	5·9	6·3	4·51	6·27	5·25	6·30
25	5·8	6·4	4·51	6·28	6·10	7·12
26	5·7	6·4	4·50	6·29	6·56	8·6
27	5·7	6·5	4·50	6·29	7·42	8·59
28	5·6	6·5	4·50	6·30	8·31	9·49
29	5·5	6·6	4·50	6·31	9·22	10·39
30	5·4	6·6	4·50	6·31	10·11	11·32
31	5·4	6·7			11·7	

Phases of the Moon, Occultations, &c.

1st Oct.	☽ First Quarter	3 6	p.m.
9th „	○ Full Moon	7 37	p.m.
16th „	☾ Last Quarter	7 24	a.m.
23rd „	● New Moon	6 42	p.m.

Apogee, 2nd October, at 9.0 p.m.
Perigee, 16th October, at 6.0 p.m.
Apogee, 30th October, at 5.0 p.m.

Jupiter will apparently come to a standstill on the 19th, though, in reality, moving for a short period by fractions of a second. Travelling on its direct course, it will cross from the constellation Capricornus into Aquarius at the end of the month.

At 10 a.m. on the 26th, Venus will be 8 degrees south of the crescent Moon. Good eyes may then find a faint image of the bright planet about halfway from the eastern horizon to the zenith. On the 30th it will reach its stationary point, after which it will rapidly decline in altitude, and in less than a month leave our evening sky.

Mercury rises at 5.20 a.m., 14 min. after the Sun, and sets at 5.17 p.m., 34 min. before the Sun, on the 1st; on the 15th it rises at 5.5 a.m., 14 min. before the Sun, and sets at 6.11 p.m., 14 min. after the Sun.

Venus rises at 7.36 a.m., 2 hr. 2 min. after the Sun, and sets at 9.19 p.m., 3 hr. 28 min. after it; on the 15th it rises at 7.13 a.m., 1 hr. 54 min. after the Sun, and sets at 9.7 p.m., 3 hr. 20 min. after it.

Mars rises at 4.35 a.m. and sets at 4.8 p.m. on the 1st; on the 15th it rises at 4.5 a.m. and sets at 3.53 p.m.

Jupiter rises at 2.25 p.m. on the 1st and sets at 3.34 a.m. on the 2nd; on the 15th it rises at 5.22 p.m. and sets at 5.12 a.m. on the 16th.

Saturn rises at 6.21 p.m. on the 1st and sets at 6.11 a.m. on the 2nd; on the 15th it rises at 5.22 p.m. and sets at 5.12 a.m. on the 16th.

Of a total eclipse of the Moon, nothing will be visible in Queensland; and in Western Australia, only the beginning on the 8th of next month. On the same date there will be a conjunction of Mercury and Venus nearly an hour before they rise, but they will not be far apart near the western horizon, Venus setting at 7.6 p.m. and Mercury about half an hour later.

The Southern Cross will become invisible at the end of October, but the brilliant stars of Orion will rise in the east while Scorpio is setting in the south-west.

6th Nov.	○ Full Moon	8 23	a.m.
15th „	☾ Last Quarter	2 20	a.m.
23rd „	● New Moon	10 5	a.m.
30th „	☽ First Quarter	1 59	p.m.

Perigee, 11th November, at 2.0 p.m.
Apogee, 27th November, at 1.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling**, members of Agricultural Societies, **Five Shillings**, including postage. General Public, **Ten Shillings**, including postage.

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Event and Comment

State Transport Co-ordination.

CO-ORDINATION in the public interest of all forms of transport is the object of a new measure which was submitted to the State Parliament in the course of the month. In a large, sparsely populated country like Queensland, transport services are, obviously, of major importance. In moving the second reading of the Bill, the Premier, Hon. W. Forgan Smith, sketched briefly the development of mechanised communications within the State, with particular reference to the revolution in transport which followed the coming into general use of the internal combustion engine. He emphasised the importance of railways, however, to the extension of land settlement and their influence on the general progress and wealth of Queensland, and expressed the view that Queenslanders must at all times depend on rail carriage for many of their material needs. He said, for example, that under no conditions to be visualised to-day could heavy haulage be transferred from the railways to some other means of transport.

Continuing, the Premier said that the wise policy of building railways from natural ports to the interior had produced in Queensland a better distribution of population than exists in any other State of Australia.

The miles of railway open for traffic in Queensland are 6,500 and 45 per cent. of that mileage is within territory containing only 15 per cent. of the population. The importance of those facts cannot be lightly regarded when transport problems and the financial position of railways generally are being considered.

The average goods revenue of the railways per ton mile last financial year was 1·68d. For every ton of goods hauled 100 miles the Railway Department received 14s., and empty haulage involved approximately 33⅓ per cent. of the total haulage, wagons being loaded to only 70 per cent. of their capacity.

Having regard to these important facts the difficulty of running State-owned railways on a strictly profitable basis, using the term "profitable" in the sense that the accountant of a joint stock company would use it, could be perceived, the Premier added. It was a good thing that the railways were owned by the State, because in no circumstances "would any private company, which seeks profits first, be likely to have built so much railway mileage in Queensland. From the point of view of the real development of the State, taking Queensland as a whole, who could urge that a loss has been sustained? The building of those long lines from seaports and the building of branch lines has enabled us to open up for the people, settle, and bring under production, lands that would otherwise still be in a virgin state to-day. Obviously, we have to regard the economy of a country as a whole and not in separate parts."

Mr. Forgan Smith went on to say—

> "In the Estimates the consideration of which we have just concluded each department is outlined in detail, but to obtain a proper bird's-eye view of the economy of the State we must pool all our resources and see the picture as one complete whole. Obviously, for instance, land revenue must be taken in conjunction with railways. If those railways had not been constructed and settlement had not followed, that land revenue would not be available. So that to take but one instance, the revenues of the railways and those of the land, from the point of view of Queensland's economy, have paid this country handsomely . . . . . "
>
> "If we want to arrive at a true balance of the assets and liabilities of our railway system, and the part that it plays in national economy, then land settlement, land revenue, agricultural development and population must all be added to the credit side. Viewed from that standpoint we realise that the Railway Department has played, and will continue to play, a very important part in the development of this country."

Development of Motor Transport.

DEALING with the development of motor transport, the Premier stated that no one could dogmatise as to what might happen in the next fifty years, but whatever path of development road transport might take with the internal combustion engine, it was extremely unlikely that heavy transport on roads would ever replace the railways.

The Premier then went on to describe the general expansion of motor transport which led to the establishment of the Main Roads Commission. The Commissioner of Main Roads and his engineers, he said, did not look at the building of a road merely from the point of view of constructing a roadway from one given point to another. They did not look at it from the engineering point of view alone, although that was of major importance. They made a very extensive contour survey of the country that the road was to serve. They found out the class of crop that the land was expected to grow and the use to which that land would be put, and the final survey provided for the road that would be most suitable for the settlers whom it was intended to serve.

The activities of the Commission had grown very extensively since it was established, and last year it spent £1,455,752 on road construction, and that figure excluded the amount spent by the Public Estates Improvement Branch of the Department of Public Lands and the amount spent under various schemes by the local authorities.

Since the inception of the Main Roads Commission it had spent £14,203,050 on its own activities, excluding the activities of the other authorities mentioned, and its annual expenditure was growing with the needs of the population and the demands for better facilities. The wear and tear on main and developmental roads by heavy vehicles was considerable.

In some quarters, the Premier remarked, there had been a tendency to deprecate railways and to approve of road transport, but much of that controversy was propaganda. Each form of transport had its rightful place in a well-organised community.

The principle had been laid down, however, that users of public highways as an instrument of business should pay a service fee for the facilities and advantages provided. Anyone who objected to that principle obviously wanted a private gain at community cost. The type of vehicle and the load of the vehicle were important considerations in fixing the value of that highway service. Some types of vehicle wore the roads more than others. For example, a motor lorry with flat, hard tyres, carrying a heavy load, damaged the road more than a similar vehicle shod with pneumatic tyres carrying a similar load.

Motor transport to-day was capable of supplying and was supplying a community need. Competition among the transport services, however, must be regulated. Just as they had to regulate railways, so a similar problem was presented in road transport. Just as a railway company or a railway department did not allow any more trains on a line than were required to give an effective service, so the principle applied to heavy vehicles running on a traffic road.

There was a provision in the Bill enabling drivers of heavy vehicles to obtain Industrial Court awards. There was also an important provision regulating the time—and this applied to both owner-drivers and employees—that anyone might drive a heavy vehicle continuously.

In the past there had been very gross cases of overloading. In policing the existing Act it had been found that 2½-ton vehicles had been loaded with as much as seven tons. Motor vehicles loaded to their capacity had been observed going up the Toll Bar road to Toowoomba in reverse gear. That indicated the extent to which overloading was taking place, and such overloading was a danger to the public and all others concerned, and must be stopped in the public interest. The rigid policing of the Act had almost wiped out that type of offence, but continued vigilance would be maintained to preserve reasonable loading on road transport vehicles.

The Premier stated further that the principles contained in the Bill were in accordance with his policy speech at Mackay, when he said:—"Labour is anxious to promote co-ordination and a friendly spirit of co-operation among all transport agencies for the best service of the public. Labour's proposals aim at alloting to each form of transport its appropriate function and so avoiding wasteful competition, but at the same time securing equitable conditions to all. In all matters affecting transport, as in public policy generally, Queensland's interests will be paramount."

The Control of Banana Rust Thrips.

N. E. H. CALDWELL, B.Sc.Agr., Assistant Research Officer.

(*Continued from p. 449, Part 4, Vol. L.—Oct.,* 1938.)

XI. THE CONTROL OF RUST.

(1) Legislation.

The present policy of the Queensland Banana Industry Protection Board is to discourage the transference of planting material from thrips-infested districts or localities to districts or localities thought to be free from the pest, or from localities heavily infested to localities only slightly infested. There can be little doubt that a factor in the spread of thrips throughout the banana-growing areas of the State has been the transference of infested planting material from one area to another. At the same time there must be a gradual natural spread of the insect. Though there are now no large districts in southern Queensland free from the pest, there are within these districts many localities thought to be free or known to be only slightly infested. Therefore, the present policy of the Banana Industry Protection Board in respect of the transference of planting material should be continued, at least until some efficient method of destroying thrips on infested planting material has been devised.

(2) Use of Clean Planting Material.

Growers establishing new plantations should make every effort to obtain clean planting material, even for new plantations in infested localities. By so doing, severe rust may be avoided in the first and possibly the subsequent cuts.

At present, clean planting material can only be obtained from a plantation which is absolutely free from thrips. It must be remembered, however, that many plantations thought to be thrips-free on account of the lack of rust development on the fruit may be harbouring a small thrips population which would be quite sufficient to initiate infestation in a new area.

If material from a clean plantation is not obtainable, it should be sought from an area which has experienced only slight rust incidence. At all costs, heavily infested plantations should be avoided. The smaller the number of insects transferred to a new area, the greater will be the chance of avoiding severe rust for any given period. If the need for the application of control measures to bunches of only the first cut can be completely or even partially obviated by adequate precautions, any additional expense incurred in obtaining thrips-free, or lightly infested, planting material will be amply justified.

(3) Treatment of Planting Material.

All types of planting material from infested plantations should be pared and trimmed as severely as possible without injuring the growing tissue. Such treatment will remove adhering earth, plant debris, etc., and free the plants from a great part of the thrips population.

The usual method of paring and trimming suckers, involving the removal of the outer tissues of the corm to expose banana weevil borer channels, stripping the outer leaf sheaths from the pseudostem and

cutting off the top of the plant near the juncture of leaf petioles with pseudostem, does not completely eliminate the thrips population. Furthermore, the dipping of such pared and trimmed suckers in a nicotine sulphate bath will not ensure thrips-free planting material.

A more drastic treatment of suckers, which is practised by some growers, does not appear to be prejudicial to the subsequent growth of the plant. It entails cutting off the pseudostem not more than three inches above ground level (relative to the sucker's original position), coupled with heavy paring of both the corm and the remaining portion of the pseudostem. This treatment, followed by dipping in a nicotine sulphate bath, should destroy any thrips present on the suckers, but no experimental data on this point is available.

The use of "bits" has been brought into prominence recently for cultural reasons. This type of planting material, either with or without dipping, appears to offer the best chance of establishing a thrips-free plantation, provided, of course, that the corms from which they have been cut have been properly pared. Again, experimental evidence is not available.

The same applies to "butts," or whole corms, though cultural considerations probably preclude the wide use of this type of planting material.

Any treatment of planting material which, at a reasonable cost, considerably reduces the initial thrips population of a newly-established plantation, will probably be justified unless the plantation is situated adjacent or in very close proximity to heavily-infested bananas. As the cost is small, the dipping of both "bits" and heavily pared and trimmed suckers in a nicotine sulphate bath (nicotine sulphate 1 pint, water 60 gallons, soft soap 3 lb.) would be well worth adopting on a commercial scale by growers, even though the treatment may not completely eliminate the pest.

(4) Recommended Control Measures on Bearing Plantations.

Bagging and dusting are strongly recommended for banana rust thrips control in the plantation and the following details in connection with this method of control must be stressed.

The bag must be made of good quality "sugar" hessian, i.e., 11 oz. hessian. Bags 45 inches deep and 27 inches wide are large enough to accommodate most bunches.

Nicotine dusts should be used in which the nicotine may be present either in the free state or as nicotine sulphate, but the actual content of nicotine should not be less than 2 per cent. The physical properties are most important. A light "fluffy" kind of dust is necessary to secure adequate penetration into all parts of the bunch. Heavy, quick-settling dusts are less effective. For this reason, nicotine dusts in which some other insecticidal materials, such as sulphur, have been incorporated, are usually unsatisfactory for the control of the banana rust thrips.

The bunch must be bagged as soon as practicable after emergence from the throat of the plant. The mouth of the bag can be fastened securely round the bunch stalk above the top hand by means of string, wire or a nail. About a fortnight later the bag should be taken off, fallen bracts emptied out, adhering bracts removed, the flower bud broken off and the bag then replaced. This operation is necessary to minimise the risk of fungal infection of the fruit.

During the thrips-active season, the dust should be applied to the bagged bunches at fortnightly intervals throughout the life of the bunch, or, as an alternative, at weekly intervals for a month after the bunch is thrown, dusting then being discontinued. The former method has given satisfactory results under all conditions experienced in southern Queensland in four seasons. The second has been tried for only one season under conditions of moderate rust incidence, when it was completely satisfactory, and this treatment may, for all practical purposes, prove to be as efficacious as the first.

The first dusting should be applied either before or just after the bag is first fitted to the bunch. In the former case the bunch and the bunch stalk above the top hand can be dusted thoroughly. Quite good results, however, can be obtained by applying the initial dusting through a small hole in the bottom of the bag. All subsequent dustings are given through this aperture. When dusting through the bag, the mouth of the duster should be pointed more or less directly upwards to ensure that the dust is blown right through the bunch from bottom to top.

In all readily available makes of dust gun, it is necessary to reduce very considerably the flow of dust from the machine. Without some modification, dusters are liable to deposit excessive amounts of the insecticide on the fruit which may then require cleaning before packing.

With small hand dusters of the plunger pump type, holding about one-half pound of dust, the aperture of the hopper outlet is usually about three-eighths of an inch in diameter. The dust flow of these machines can be reduced effectively by inserting into the outlet a cork from which a V-shaped section has been cut so that the area of the aperture is one-eighth that originally provided. About six full strokes of the pump are then sufficient for the average bunch. Ideally the bunch within the bag should be enveloped in a cloud of dust, sufficient to kill the insects without leaving more than a film of dust on the fruit. With care and a little practice growers should have no difficulty in performing this operation.

Two other methods of treatment give a fair measure of control. Though not so efficient in the control of rust as bagging with dusting, they have the merit of much smaller cost and thus may sometimes be useful. For instance, they could be used early in the season as a precautionary measure until the trend of thrips activity is sufficiently clear to indicate the need or otherwise for more effective measures.

In the first of these alternative methods, the bags are dispensed with and the bunches are dusted with a nicotine dust at weekly intervals. Longer intervals between dustings are much less efficient. Treatment must be thorough. The dust must be blown into the bunch from all angles, particular attention being paid to the top hands, where the thrips infestation is heaviest, especially if the bunch is at all choked. At the same time the dust residue must be kept down to a minimum.

The second alternative method requires the use of a cloak and the application of a nicotine dust at fortnightly intervals. The cloak—a piece of hessian—is wrapped round the bunch as soon as possible after it is thrown. Thereafter the procedure is the same as with bagging and dusting, the insecticide being blown on to the bunch from the bottom and the exposed side, if any. The cloak must be of the good quality hessian and large enough to envelop the bunch fairly completely.

It is necessary to stress the fact that open mesh, inferior quality hessian, when used either as bags or cloaks, has not proved satisfactory in rust control experiments.

Dusts, either alone or under bags or cloaks, should not be applied when the bunches are wet, as heavy dust residues may accumulate on the fruit under these conditions. Owing to the protective action of the sugar hessian, bunches enclosed in bags can be dusted with much less interference from rain than uncovered bunches. Only during heavy and prolonged rain, which, of course, is fairly common during the thrips season in most of Queensland's banana-growing districts, do bunches in the bags become wet enough to prevent dusting.

Whatever control measure is adopted by the grower, every stool in the plantation should be inspected at weekly intervals, or as near thereto as practicable. Thus, even in the case of bagging with fortnightly dustings, the selection of newly thrown bunches for treatment should be carried out each week. If this is not done, some bunches will be nearly a fortnight old before control measures are applied and they may have developed a certain amount of rust and, what is more serious, acquired a dangerously large thrips population, the complete extermination of which will not be effected by the first application of dust owing to the survival of the eggs and some of the insects in more sheltered situations.

Normally, growers should be prepared to start control operations during November but a close watch should be kept on the situation from early October. When bunches less than a month old show appreciable amounts of rust, or are harbouring a large thrips population, control operations should be started immediately. Treatment should not be deferred until rusty fruit is being harvested. When control measures are first applied to newly thrown bunches those already hanging should not be neglected. November "dumps," though they may remain practically clean for some weeks, are very liable to become rusted rather badly by the time they are harvested, and it is not uncommon for October-thrown fruit to be affected similarly.

Dusting may be safely terminated at the end of April, or perhaps a little earlier in some seasons, but the incidental benefits due to bagging the fruit, and to a somewhat lesser extent to cloaking, are so great that growers should, where practicable, continue covering the bunches right through the winter.

The selection of the right time to start control work will depend on the judgment of the grower. Much time and money can be lost by faulty decisions and growers should, therefore, familiarise themselves with the appearance and habits of the pest. The insects in the adult and larval stages, the only stages with which the grower need be concerned, are readily visible to the naked eye, and the results of their work are only too obvious. Finally, it cannot be emphasised too strongly that the appearance of the young bunches in the plantation, and not the cut fruit in the shed, is the key to properly applied control measures.

(5) Related Factors to be Considered in Rust Control.

(*a*) *The Effect of General Cultural Methods on Rust Control.*—It has been clearly demonstrated that "choked" bunches tend to develop more severe rust than well-thrown ones. In addition, owing to the

compaction of the fruit in some of the hands and the consequent relative inaccessibility of the contact surfaces of fruits to dust penetration, the efficiency of all recommended methods of control is markedly reduced, particularly in respect of top hands which usually contain the best fruit on the bunch. Growers should, therefore, adopt methods of cultivation, fertilizing and suckering which promote vigorous plant growth and hence the production of loose, well thrown bunches. Vigorous growth is also associated with early fruit maturity, which is highly desirable in that it results in the exposure of the fruit to the depredations of the pest for a shorter time.

In some cases the rust control programme can be curtailed considerably by regulating the growth of the plants so that the majority of bunches will be thrown at a period which does not coincide with that of maximum thrips activity. Under present conditions, this can be done only by the regulation of sucker growth and is practicable only in the second and subsequent crops. Cultural difficulties play a dominant part in any such programme and probable market conditions must also be considered. Spring-thrown bunches escape rust to a large extent but are marketed in the summer when prices are usually low. Winter bunches are generally not of satisfactory quality. On suitable plantations, bunching should be timed for the autumn. Bunch treatment for rust control should then be unnecessary for all but March and early April bunches but, as all autumn bunches hang through the winter, they should be bagged or cloaked, irrespective of rust incidence. Despite winter conditions this treatment will ensure the development of well-filled, good quality fruit which will be ready for cutting in the spring when the market is normally buoyant.

Cutting up spent stems is essential for the purpose of controlling the banana weevil borer (*Cosmopolites sordida* Boisd.). This must have some effect, however small, in reducing the thrips population. Flower buds must, of course, be removed from bagged bunches. It is improbable that their removal has any significant effect on thrips population as it is only in the case of very severe infestations that the insects breed in these parts.

(*b*) *The Effect of Recommended Control Measures on General Plantation Operations.*—The application of the bagging and dusting method of treatment introduces certain practical difficulties into plantation operations which can be overcome by a little intelligent organisation of labour and materials on the part of the grower.

Some method of distinguishing bunches bagged each week is necessary. The bags should be numbered with a different numeral for each week, the numbers being placed on both sides of the bag in large script to facilitate recognition at a distance. The use of Roman notation would reduce printing difficulties. The ordinary blacking used in stencilling should be found quite satisfactory.

Such a method of numbering will eliminate any confusion as to which bunches require treatment in any week. It will also greatly assist in indicating the state of maturity of the bunch. In practice a knowledge of the exact age of the bunch, as shown by the number of the bag, and the feel of the fruit through the bag will enable the experienced grower to judge accurately the state of maturity of the fruit without removing the cover.

In the case of cloaked bunches no difficulty arises in readily determining the state of maturity of the fruit. However, as dusting is required only at fortnightly intervals, it is still necessary to adopt a system of marking the cloaks to distinguish those due for treatment in any week.

(*c*) *Incidental Effects of Recommended Control Measures.*—The highly beneficial effects of bagging, and to a lesser extent cloaking, on the quality of fruit and in the control of sundry pests and diseases have been stressed elsewhere. Covers have the further advantage that, if left on the bunch after cutting, the fruit is thoroughly protected on its way to the packing shed. The colour of bagged and cloaked fruit is rather pale but this does not prejudice marketing. There is, therefore, no need to remove the bag for the last week or two before cutting the bunch in an attempt to darken the colour, a practice which frequently causes severe scalding.

(*d*) *Marketing Rusty Fruit.*—In the southern States rusty fruit is more severely penalised than in many Queensland markets, where consumers are more familiar with it. No matter how efficiently control measures are applied, growers will still have some blemished fruit, especially in bad rust years. If this fruit is marketed locally at a slight discount, the clean fruit can be reserved for markets in the southern States. In this way each grower could do much towards maintaining a good reputation for his brand in the south and thus avoid the risk of depreciated prices.

(6) The Special Problem of Control in Tall-growing Varieties.

The control measures outlined have, of course, been developed for the dwarf Cavendish variety which is overwhelmingly the most important in Queensland, particularly in the severe rust areas.

Tall-growing varieties such as Lady Fingers and Sugars are grown chiefly in southern Queensland, though, for the most part, beyond the limits of severe rust infestation. Mons Marie, a variety which is tall-growing under favourable conditions, is at present being more extensively planted throughout the southern portions of the State. None of these varieties is immune from rust. As the bunch in all these varieties is normally out of reach, rust control presents a special problem. The labour involved in bagging and dusting the bunches might render the method uneconomic. Cloaking and dusting offers somewhat better possibilities since bract and bell removal can be dispensed with. Dusting operations would necessitate a large duster of the knapsack type provided with a greatly extended feed arm.

In the event of severe rust infestation in areas of tall-growing varieties, it seems obvious that further enquiries into the matter of control will be necessary.

(7) Geographical Limitations of Control Recommendations.

The control measures detailed above have been designed for conditions in the south of the State. They have not been tested in Central and North Queensland where conditions are very different in many respects. Their value in these regions still requires investigation.

(8) The Economics of Control.

The cost of the various control measures is admittedly rather high. Bagging and dusting is estimated to cost rather less than 6d. per bunch

and dusting alone in the vicinity of 2d. The cost of cloaking and dusting will depend on the price of the material used for cloaks but should be intermediate between the other two methods.

These costs are based on wages at the rate of 15s. per diem, the ruling market rates for dusters and dust, the price of bags purchased in lots of one hundred and the assumption that one bag will serve for two bunches. By strict attention to detail growers should be able to operate under commercial conditions at costs below these estimates. The price of bags would probably be reduced appreciably if large quantities were purchased. In addition, if the bags are thoroughly dried and stored in a dry place free from vermin when not in use, the majority will last for at least three bunches. Efficient organisation will keep labour costs down to a minimum. One man should be able to dust four to six acres on the average plantation in a working day of eight hours. The time required for marking bags, placing them in position and their subsequent attention must, of course, also be taken into consideration. The cost of dust and dusters is relatively insignificant compared with the two main items of cost—viz., bags and labour.

The minimum profit which can be expected from the efficient application of rust control measures is represented by the return obtained for the fruit which would otherwise be unmarketable. The cost of control will usually be amply covered by the enhanced prices for the remainder of the fruit, due to the absence of rust and improved general quality. As the wastage in a bad thrips year may represent from 10 to 50 per cent. of the season's total crop, there is no doubt that rust control will pay handsomely, except perhaps under extremely depressed market conditions.

XII. SUMMARY.

(1) The history of *Scirtothrips signipennis* Bagnall as a pest of bananas in Queensland and its occurrence in other parts of the world are briefly reviewed.

(2) The importance of banana rust thrips to the industry is discussed, and it is concluded that the pest has played only a minor part in the recent diminished production.

(3) A summarised account is given of the bionomics of *S. signipennis,* based on previous investigations and observations made during recent work.

(4) Originally of economic importance only in North Queensland, the pest is now established in most banana-growing districts. Two major outbreaks in 1923-5 and 1930-33 caused widespread losses. More recently the pest has been relatively unimportant, but individual plantations may suffer each year.

(5) The available information on population fluctuation and epidemic outbreaks of the pest in Queensland is reviewed. Topography of the plantation has a definite bearing on the population, probably as a result of temperature effects. Meteorological data sheds little light on the phenomenon of epidemics. Widely held views on the irregular distribution of the pest are examined, but none can be accepted without question as valid explanations of the phenomenon. The lessened susceptibility of aged plantations to attack also remains unexplained.

(6) A detailed account is given of the injury caused to the banana plant.

(7) Extensive control experiments conducted in the field during four consecutive seasons are described. The most satisfactory results were obtained from repeated treatment of the bunch with nicotine dusts either alone or in conjunction with hessian bags or cloaks. The best control was obtained by using bags made of 11-oz. sugar hessian in conjunction with fortnightly applications of a nicotine dust throughout the life of the bunch, though the restriction of the dustings to three at weekly intervals in the early stages of bunch development gave comparable results in the single experiment of this type carried out. Bags or cloaks of an inferior quality hessian (10-oz.) were less satisfactory, but, in combination with certain dusting schedules may give reasonable commercial control of rust under plantation conditions. Other dusts tested, including derris, pyrethrum, sulphur and calcium cyanide, singly or in various combinations, were less efficient than nicotine dusts, either when used alone or with bags or cloaks. Good quality bags and cloaks without supplementary dusting gave fair control in some experiments but proved unreliable. The treatment of the whole plant with nicotine dust proved both uneconomical and inefficient.

(8) The possibilities of several other methods of bunch treatment were examined but did not warrant large-scale field trials.

(9) Plants grown under glasshouse conditions from suckers pared, trimmed and dipped in a nicotine sulphate bath before removal from the plantation acquired a banana rust thrips population. Such treatment cannot, therefore, be relied upon to give thrips-free planting material.

(10) Control measures based on these experimental results are formulated and shown to be both practical and effective. The principal control recommendation necessitates bagging the bunches as soon as practicable and dusting with a nicotine dust fortnightly during the whole growth period of the bunch. Alternatively, the bagged bunches may be dusted weekly for the first month only.

XIII. ACKNOWLEDGMENTS.

During the course of these rather extensive investigations the author has been rendered valuable assistance by many persons. Free access to their plantations for experimental work was afforded by nine banana growers. Messrs. Buzacotts (Qld.) Ltd. provided free samples of dust in one season. Of fellow officers of the Department of Agriculture and Stock, Messrs J. A. Weddell, A. R. Brimblecombe, and C. W. Winders assisted in the field work in 1933-34; many officers of the Fruit Branch provided transport facilities and helped in other ways, especially Mr. J. R. Horsley, Banana Agent, Pomona, in whose district the bulk of the experimental work was carried out; various other officers consulted from time to time were ever ready to assist with information and advice. To all these the author's sincere thanks are tendered. Finally, it is desired to acknowledge the help of Mr. J. Harold Smith in the preparation of the manuscript and in other matters, and of Mr. Robert Veitch, firstly as Chief Entomologist and latterly as Director of Plant Industry (Research), who provided the facilities for the work and whose encouragement and advice were greatly appreciated in its performance.

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THE PLOUGH.

The plough is still the most important implement in agriculture, in spite of all the engineering progress which has been made. Over and over again it has been claimed that our modern cultivators have reached the stage of development when they are considered capable of doing the whole work of preparing the soil without the use of the plough. But time has proved that the plough still remains indispensable. The rototiller, or some other implement, may one day push the plough on to the farm scrap heap, but that time has not come yet.

To obtain the best results from a plough, the discs or mouldboards should never be allowed to rust. It is only a small job to clean and grease them immediately after use, and particularly when the implement is to remain out of use for any length of time. Mouldboards or discs which have become pitted as a result of rust do not work as smoothly when working in moist or heavy soil as those with a bright smooth surface.

Most of the bad ploughing seen on a day's run through farming lands can be traced to the faulty setting of the plough. Apart from other points, the influence of "set" on the draught of the plough is very great. Another serious result of faulty setting is the wear and tear on the plough itself.

Again, disc ploughs with badly-worn discs are frequently seen in use. Provided the plough is otherwise mechanically sound, the obvious remedy for faulty ploughing in such cases is to fit a new disc.

After all, it is not a hard job to set a plough properly. There is no magic or mystery about it. No special skill is called for. All that is required is a fundamental knowledge of the purpose of each part of the implement, and the ability to use that knowledge, so as to make each part work in harmony with the whole, and thus preserve what is known as the "balance" of the plough. Any experienced ploughman will show the new hand how to set the implement, and, while on the job, there is nothing better than a sweetly running plough.

The Acidification of Alkaline Nursery Soils for the Production of Exotic Pines.

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THE most important softwood planted in Southern Queensland is the hoop pine, *Araucaria cunninghamii*. In the early years of its development this tree will not stand heavy frosts, and it is essential to avoid affected areas when planting with this species. It has therefore been found necessary to provide a "filler" species for the localised areas which are subject to frosting. The proportion of these areas in the Brisbane Valley rises to from 10 to 20 per cent., and the quantity of planting stock of the species required is considerable. Experiments are current to determine the possibility of using indigenous forest trees on frosted sites, but in the meantime recourse is made to exotic species, principally *Pinus caribæa*. The use of these species in conjunction with hoop pine gives rise to the necessity for making the production of exotics a subsidiary function of hoop-pine nurseries. Attempts at producing exotics in the Yarraman nursery in sufficient quantities to meet the requirements of part of the Brisbane Valley area were not attended with very satisfactory results, and necessitated the importation of the required nursery stock from coastal nurseries—a procedure involving considerable expense. This led to an inquiry into the reason for the failure experienced in the area concerned.

Preliminary investigations at the Yarraman nursery revealed the frequent absence of mycorrhizal structures on exotic seedlings in the nursery beds, and the unthrifty growth was considered to be bound up with this phenomenon. The seed on sowing was found to germinate successfully, and the seedlings grew to a height of 3 to 4 inches, but then became chlorotic and spindly, and growth ceased. This was usually followed by death of the plants. The introduction of vigorous plants with well-developed mycorrhizal root systems, with the object of infecting the nursery soil with the symbiotic fungus, together with the addition of organic manure to the beds, was tried without success. Hydrogen ion concentration determinations revealed the alkaline state of the nursery beds. This alkalinity is presumably due to the relatively low rainfall, the light frequent waterings and high evaporation rate causing an upward movement of the soil bases. It seemed likely that, although the nursery soils were for the most part suitable for raising the native species, their alkalinity might be a limiting factor in the case of exotics. Experiments on the effectiveness of increasing the acidity of the nursery beds at Yarraman were consequently initiated.

Soil Acidification in General.

Usual practical methods of soil acidification are by means of treatment with aluminium sulphate, sulphuric acid, or ground sulphur. Sulphur was used in France in viticultural and other work in the nineteenth century, and in 1877 Panknin, of Charleston, South Carolina, suggested that sulphur mixed with ground bone or mineral phosphates produced sulphuric acid when incorporated with the soil, thus making the phosphorus available. He patented his process in 1878, and a similar patent was taken out by B. Chisholm, of the same town, in 1904. Lipman

in 1916 observed that sulphur applications were successful in the treatment of potato scab, and suggested that sulphur applications in agricultural practice would make the soil phosphates available by acidifying the soil, and he commenced experiments which demonstrated this. Hibbard (1921) also showed that the application of sulphur could be used to acidify alkaline soils. Joffe and McLean (1924) came to the conclusion that the value of the sulphur was in providing hydrogen ions which replaced the calcium and sodium cations in the exchangeable bases of the soil. The salts formed are in the form of alkaline or alkaline earth sulphates. By means of this breakdown there is brought about a solvent action towards a number of essential plant foods which were formerly present in insoluble and unavailable forms. The principal solvent effect of sulphur oxidation is on the calcium carbonate of the soil (McGeorge and Greene, 1935), and sulphur therefore increases the availability of calcium as a plant food in alkaline calcareous soils. The size of the sulphur particles appears, from the work of these authors, to have little effect upon the rate of oxidation or its effects, and therefore ordinary agricultural ground sulphur is suitable for soil applications.

Although the oxidation of sulphur to sulphuric acid by bacteria in the soil, on which the above reactions depend, is a process which has been well known for many years, it is only comparatively recently that the phenomenon has been investigated in detail. Liebig was perhaps the first to suspect that the oxidation was a biological process (Lipman, 1916). The nature of the true sulphur bacteria was shown by Lipman, Waksman, and Joffe (1921), by Joffe (1922), and by Waksman (1922). The bacterial oxidation of elementary sulphur in soil is brought about chiefly by the genus *Thiobacillus*, which Bergey (1930) describes as "small, rod-shaped organisms deriving their energy from the oxidation of sulphides, thiosulphates or elementary sulphur, forming sulphur, persulphates, and sulphates under acid or alkaline conditions and deriving their carbon from carbon dioxide or from bicarbonates and carbonates in solution; some are obligate, and some facultative autotrophic; one species is anærobic."

The chemical oxidation of sulphur to sulphuric acid in the soil also occurs, but it is unimportant compared with the biological process. It has been shown by Kappen and Quensell (1915) that flowers of sulphur is not appreciably affected in a sterile soil, but that milk of sulphur undergoes oxidation. There is evidence that the chemical oxidation of sulphur in the soil decreases with the increasing size of the sulphur particles.

Work in Australia on soil amelioration by means of sulphur application has been carried out by Rountree (1933) on an alkaline South Australian soil—namely, the Renmark clay loam. This author studied the effect of soil temperature and soil moisture on the rate of sulphur oxidation, and isolated an organism from the soil in question and studied its reactions in sterilized soil. Sulphur had also been used by Sideris and Krauss in 1933 for soil acidification purposes in Hawaii in connection with pineapples, and Lewcock (1935) in Queensland has used it in connection with the control of pineapple wilt.

Investigations in Queensland.

In the preliminary trials carried out with the object of correcting the alkalinity at the Yarraman forest nursery, sulphur and aluminium

sulphate were used as acidifying agents. The results indicated that aluminium sulphate, although successful in increasing soil acidity, was toxic to the pine seedlings when used in quantities sufficient to produce the required pH value. The results obtained from the sulphur treatments justified further investigation.

Nursery trials were therefore established using a series of four nursery beds, each 4 feet wide. The experiment was laid out as a randomised block of seven treatments with four replications. Each unit plot was 4 feet square, with isolation strips 15 inches wide between each two plots. The treatments used were as follows:—

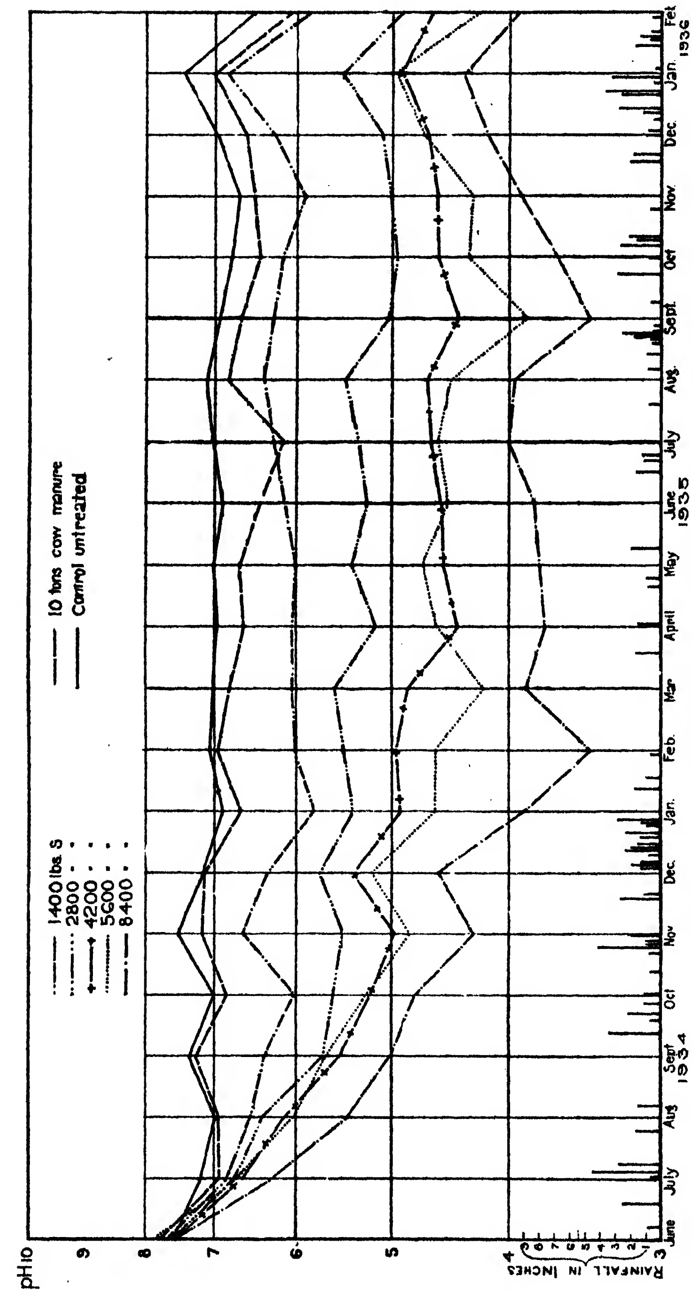
(*a*) Ground sulphur at the rate of ½ lb. per plot (1,400 lb. per acre).
(*b*) Ground sulphur at the rate of 1 lb. per plot (2,800 lb. per acre).
(*c*) Ground sulphur at the rate of 1½ lb. per plot (4,200 lb. per acre).
(*d*) Ground sulphur at the rate of 2 lb. per plot (5,600 lb. per acre).
(*e*) Ground sulphur at the rate of 3 lb. per plot (8,400 lb. per acre).
(*f*) 0.6 cubic feet of rotted cowdung per plot (10 tons per acre).
(*g*) Untreated control.

Soil samples were taken from each plot before treatment, and pH determinations were made. A complete analysis of the untreated soil was also made. The treatments were applied to the plots on 13th June, 1934, the dressings being well mixed with the top 6 inches of soil in each plot. There was a very noticeable smell of hydrogen sulphide in the neighbourhood of the sulphur-treated soil for a number of weeks after treatment. Monthly pH determinations were made by means of an antimony electrode by the Agricultural Chemist on samples obtained from each plot until 15th February, 1936. The readings taken were made from composite soil samples taken to a depth of 8 inches.

After the sowing of the seed, the beds were kept moist until the seedlings were established, and then were allowed water at the rate of 20 points per week until the conclusion of the experiment, except where higher rainfalls made this impossible. Moist, cold-stored seed of *Pinus caribæa* was sown in all the beds at the rate of sixteen seeds per linear foot of drill on 15th February, 1935, when the pH levels had become approximately constant. The drills were made 8 inches apart, thus allowing five drills per plot.

Records were kept concerning the monthly condition of the plants in each plot, and at lifting on 15th February, 1936, specimens of the root systems of plants growing in each plot were preserved and later examined microscopically. Weather data were recorded. The pH results obtained each month for each plot were averaged for each treatment at the conclusion of the experiments and the results plotted against time (Plate 183). The monthly rainfall was plotted on the same graph for purposes of comparison. In the case of the graph illustrating the relationship of pH and time, semi-logarithmic paper was, perforce, used. The sulphur dressings were worked out in pounds per acre to correspond to the treatments as noted at the commencement of the experiment. Rainfall data were given in inches per diem.

On referring to the graph, it will first be noted that there was a general fluctuation in pH throughout the period, even in the control. These fluctuations followed the trend of the rainfall, the pH rising after



GRAPH ILLUSTRATING EFFECT OF TREATMENT ON pH.

Plate 183.
Effect of Treatment on pH.

any appreciable fall of rain. This effect was also noted by Sideris and Krauss (1934), who thought it was due to the dissolved H_2CO_3 in the wet soil causing the higher acidity, and that it was helped by the washing down to the deeper layers of the soil of the basic salts. On examining each individual curve, it will first be noted that there is a close agreement between the results for the untreated control plots and those for the plots treated with cowdung, showing that the addition of cowdung in the quantities used made no appreciable difference to the pH value of the plots thus treated. The results obtained by treating the soil with any of the quantities of sulphur used show a definite drop in pH values as compared with the control, the heavier treatments affecting the results proportionately. The time taken to reach a constant pH, disregarding such other factors as rainfall, varied with the intensity of the sulphur application.

Effect of Treatment on Plant Growth.

For the purposes of the experiment, the three middle rows of each plot were used for observation purposes, thus leaving the two outside rows as extra isolation space. In all plots germination was successful, but succeeding events considerably modified the final appearances of each treatment. The subsequent results in the plots treated with cowdung were very poor on account of the seedlings' damping off after appearing above ground. In the treatment receiving sulphur at the rate of 3 lb. per plot the seedlings in many cases died soon after reaching a height of approximately 3 inches. The mean number of plants surviving per plot of three rows for each treatment at the end of the experiment is shown in Table 1.

TABLE 1.

NUMBER OF PLANTS SURVIVING PER MEAN PLOT.

Treatment per Plot.	Number Surviving Plants per Mean Plot.
½ lb. sulphur	95·7
1 lb. sulphur	70·5
1½ lb. sulphur	114·25
2 lb. sulphur	87·5
3 lb. sulphur	39·75
Cowdung	13·25
Control	78·75

After the germination of the seed the plots were inoculated by planting between every two rows in each plot at the southern ends of the drills a twelve-months-old plant of *Pinus caribæa* with its roots infected with *Boletus granulatus*, which is one of the chief mycorrhiza-forming fungi, in the case of *Pinus*, in Queensland. Periodic checks were made of the distance of spread of the mycorrhizal fungus along the rows, together with observations on the general appearance of the seedlings and of the plants used as a source of *Boletus granulatus* infection. At the end of the experiment the state of the plants in each treatment was summarised (Table 2).

TABLE 2.

THE FINAL CONDITION OF PLANTS IN EACH TREATMENT.

Treatment per Plot.	Vigour.	Type of Growth.	Colour.	% Plants Infected.	Average Height Infected Plants.
					Inches.
A. ½ lb. sulphur ..	Fair ..	Fair to spindly	Good ..	30·5	9
B. 1 lb. sulphur ..	Fair ..	Fair	Good ..	41·1	9
C. 1½ lb. sulphur ..	Good ..	Good	Good ..	30·0	11
D. 2 lb. sulphur ..	Fair ..	Spindly.. ..	Light ..	28·4	8
E. 3 lb. sulphur ..	Poor ..	Spindly.. ..	Chlorotic ..	6·9	6½
F. Cowdung	Poor ..	Spindly.. ..	Chlorotic ..	0·6	6
G. Check	Poor ..	Spindly.. ..	Chlorotic ..	23·4	8

It would appear from this table that the efficiency of the mycorrhizas are increased with increasing acidity up to pH 4·7, and thereafter are adversely affected. The survival of seedlings in the control plot was good, but the vigour was low and the growth poor. The general appearance of the plants indicated that the 1½ lb. of sulphur treatment was the most satisfactory, with a trend to lessening in quality of the plants both with heavier and with lighter treatments. The surviving plants in the cowdung treatment were of equal quality to those in the control.

The effect on the transplanted plants, which were put in the various plots for mycorrhiza infection purposes, of their twelve months' sojourn in the treatments was as shown in Table 3. This data indicates that the

TABLE 3.

EFFECTS OF TREATMENTS ON TRANSPLANTS.

Treatments per Plot.	Condition of Transplant.
½ lb. sulphur	Chlorotic colour, fair plants
1 lb. sulphur	Fair, some growth
1½ lb. sulphur	Good, growing well
2 lb. sulphur	Good, growing well
3 lb. sulphur	Chlorotic colour, no growth
Cowdung	Dead
Control	Some chlorosis, fair

transplanted stock, although apparently able to stand greater extremes than the seedlings, followed the same trend as regards desirable pH values. The death in the cowdung plots appeared to be due to root rots.

Effect of Treatment on Mycorrhiza Development.

The development of mycorrhizas in each treatment was noted by means of counting the number of plants with externally observable infection. According to Table 2, the results in the plots having ½ lb., 1 lb., and 1½ lb. sulphur each were very similar when the irregular

distribution of plants in the plots was allowed for. There were slightly fewer in the 2-lb. plots and a very small number in the 3-lb. plots, and practically none were observable in the cowdung treatment. The number in the control treatments was less than that in the 2-lb. plots.

In the more acid plots—namely, those treated with sulphur at the rate of 1½ lb. per plot and more—crystals of calcium oxalate were always found on and in the soil immediately surrounding the roots of the plants in increasing amounts, and to a much larger extent in non-mycorrhizal than in mycorrhizal plants. In the 1½-lb. plot the deposit was only present on non-mycorrhizal plants. The significance of this phenomenon is not known, but it is suggested that the appearance of this crystalline deposit outside the roots is due to the relatively large amount of calcium sulphate formed in the soil by the action of the sulphuric acid, formed from the added sulphur, on the calcium carbonate normally present. The oxalic acid would be produced as an excretory product by the pine roots. The less frequent appearance of these crystals on mycorrhizal roots could be due to the controlling effect on pH in the immediate environment by the ectotrophic mycorrhizal fungi on the surface of the roots. These normally tend to produce a substratum of constant acidity. This degree of acidity would apparently be somewhat less than that appertaining in regions outside their sphere of influence. Much more calcium oxalate was formed in those plots which were too acid for the fungal development. The optimum pH value for growth of the mycorrhiza-forming fungi in question is pH 5-6. In hoop pine, *Araucaria cunninghamii*, where the mycorrhizal fungus is endotrophic as in *Sciadopitys*, no such limiting effect on the formation of calcium oxalate occurs. In this case the deposit is freely formed on the roots of infected hoop-pine plants in sulphur-treated nursery beds at Yarraman, when no such deposit is formed on infected *Pinus caribæa* at the same pH value. It is thought possible that the calcium oxalate formation may be a temporary character in a treated soil of this nature and that the effect may disappear in time with the gradual disappearance of the calcium sulphate.

The fact that all the plants in the best plots were not infected by the mycorrhizal fungus is thought to be due to the time factor and the spacing of the plants in the beds. The fungus appears to require, for quick dissemination, actual contact with the pine roots, and therefore complete infection of a nursery bed would take some considerable time if natural growth were depended upon. Artificial dissemination, by means of distributing infected soil throughout the nursery beds, and subsequent cultivation ensures good infection when the requisite soil conditions of acidity, moisture, and organic content are provided.

Effect of Acidification on Type of Mycorrhiza.

Microtome sections of root specimens obtained from plants in all the treatments involved in the nursery experiment were cut, stained, and mounted, and examined microscopically in order to obtain some idea of the effect of the various treatments on the mycorrhizal complex. The relative effects are tabulated in Table 4. These differ somewhat from the microscopic observations shown in Table 4 in the case of the cowdung treatment, in which no ectotrophic mycelium was visible to the naked eye, though obviously present in the mounted sections.

TABLE 4.

THE EFFECT OF SULPHUR APPLICATION ON MYCORRHIZA FORMATION.

Treatment per Plot.	Mantle.	Hartig Network.	Intracellular Hyphae.	Cell Contents,
Control ..	Well developed	None ..	None ..	Non-granular
½ lb. Sulphur	Well developed	Well developed	Fair	Many digestion products
1 lb. Sulphur ..	Well developed	Well developed	Fair	Many digestion products
1½ lb. Sulphur	Well developed	Well developed	Fair	Many digestion products
2 lb. Sulphur ..	Very thick ..	Well developed	Very occasional	Few digestion products
3 lb. Sulphur ..	Thin	None	Some	No digestion products
Cowdung ..	Well developed	Medium ..	None ..	Few granules

From this it will be seen that the mycorrhizal development varies from strictly ectotrophic in the case of the untreated controls, through the typical ectendotrophic in the 1½ lb. of sulphur treatment to the almost purely endotrophic in the 3 lb. of sulphur treatment. In the case of the control treatment the fungus did not penetrate into the root and appeared to be living more or less independently on the root surface. This was closely simulated by the cowdung treatment, in which case, however, the cells had more granular contents. The ½ lb. of sulphur type is ectendotrophic, with the presence of an external mantle, a Hartig network, intracellular hyphæ and broken-down mycelial products due to digestion of the fungus in the cells by the root. The types produced by 1 lb. and 1½ lb. sulphur treatments (Plate 184) are similar, and represent a well-balanced root-fungus relationship in which the fungus is being adequately controlled; whereas in the case of the 2 lb. of sulphur treatment the mantle has become thicker with a well-developed Hartig network but little intracellular invasion and few digestion products. In the case of the 3 lb. of sulphur treatment, however, the fungus appears to have developed a parasitic habit with a well-developed inter- and intra-cellular mycelium without any evidence of hyphal digestion by the invaded cells. The mantle in this case is extremely thin. These microscopic findings are, from the symbiotic point of view, directly correlated with the general appearance of the plants. In the observations it was noted (Tables 2 and 3), that the treatments with ½, 1, and 1½ lb. of sulphur per 16 square feet gave the most satisfactory planting stock, with the 1½-lb. treatment being generally the best. This same relationship is reflected in the root association with the mycorrhizal fungus where the true mutualistic relationship is developed in these treatments.

Practical Applications.

The nursery beds at Yarraman form a good example of sulphur treatment in practice. Following on the results obtained from the experiment described above, the section of the nursery which was to be sown with *Pinus caribæa* seed was treated with sulphur at the rate of 1½ lb. of ground sulphur to each 16 square feet of bed space, and was then well dug over to mix the soil. In addition, the beds were given a

dressing of cowdung to augment the organic content of the soil, it having been found that with a suitable acidity such an application is advantageous when the soil organic matter is low. The first crop of seedlings produced was infected by the mycorrhizal-forming fungus only in patches, but these areas extended as the season progressed. The original infection was introduced from Beerwah. After lifting this stock, the soil in the

Plate 184.

Photomicrograph illustrating healthy mycorrhizal root tip in plot dressed with 1½ lb. of sulphur.

beds was again well mixed, with the result that the succeeding crop was well infected throughout and produced good vigorous planting stock. In this manner the simple treatment of the beds with a requisite quantity of sulphur resulted in the successful production of vigorous plants of the species of *Pinus* required, thus enabling the nursery to complete its planting programme without the necessity of obtaining supplies from another district.

In another instance it was found necessary to determine the sulphur requirements of soil from the Jimna nursery for the production of exotic conifers. Laboratory tests were made involving the application of various amounts of sulphur to the nursery soil in question. The soil was weighed out in equal quantities into glass jars 8 inches deep and sulphur applied to each jar and well mixed in the soil. The rates of application of the sulphur was worked out to correspond to dressings as shown in Table 5.

TABLE 5.

EFFECT OF SULPHUR DRESSINGS ON JIMNA NURSERY SOIL.

Treatment per Jar.	Resultant pH Value.
½ lb. sulphur per 16 sq. feet surface area	6·4
1 lb. sulphur per 16 sq. feet surface area	5·7
1½ lb. sulphur per 16 sq. feet surface area	5·4
2 lb. sulphur per 16 sq. feet surface area	4·9
3 lb. sulphur per 16 sq. feet surface area	4·3
4 lb. sulphur per 16 sq. feet surface area	3·8
Control	8·0

The jars were kept at room temperature for eleven weeks and moistened periodically with equal amounts of distilled water. From the pH determinations made it was found that 1½ of sulphur would be a safe dressing for the soil in question. The nursery space devoted to the production of exotic pines was then treated accordingly.

In a case where a condition of lime-induced chlorosis developed in hoop pine seedlings owing to the nursery beds in localised patches becoming very alkaline, applications of sulphur caused a cessation of the trouble.

Maximum Acidity Obtainable in the Soil.

The absolute maximum acidity obtainable in the Yarraman nursery soil after application of excess sulphur at any time during the period of the experiment corresponds to a pH value of 3·56. The average pH value over the period of the experiment with excess sulphur present was 4·03. In the soil of the Wongabel nursery on the Atherton Tableland in North Queensland, the minimum pH reading obtainable, in the presence of excess sulphur and the same sulphur bacterium, was found to be 2·4 in the top 3 inches of the soil and 4·4 at 6 inches below the surface. This is somewhat different from the minimum pH recorded by Lewcock (1935) for the poor coastal sandy soils in South Queensland, in which case a limiting value of pH 4·5 was reached. No isolations were made in the last mentioned case, but it is considered probable that the same organism is involved. If, as appears to be the case in Queensland soils, the same organism is responsible for the acidity changes after sulphur application, then the minimum pH value obtainable would be dependent on the particular soil treated. It is considered likely that with a change in reaction a different group of soil organisms, apart from the sulphur bacteria, gains the ascendant, and that, in different soils with different amounts and types of nutrient available, competition with the sulphur bacteria becomes more severe at different pH values. Thus at a lower pH value competition in the poorer soils would be keener on account of the smaller amounts of nutrients available, and the development of sulphur bacteria less active. Hence, the possible minimum pH value producible by sulphur bacteria would vary with the quantities present of the particular nutrients governing the growth of the sulphur bacteria and the other competing organisms.

Effect of Application of Sulphur on Soil Fauna.

After the application of sulphur to nursery beds it was noted that the white grubs (Scarabæid larvæ) present in the treated beds emerged

from the soil and perished in the sun. This effect has also been noted by other observers in Queensland in the case of pineapple soils, when these are treated with sulphur. A somewhat more spectacular effect was obtained in the Yarraman nursery in the hoop pine, *Araucaria cunninghamii,* beds. These beds are normally subject to damage by the white grubs, which attack the roots of the hoop pine seedlings, devouring the cortex, and, unless checked by fumigation, cause a

Plate 185.

Left.—Root system of hoop pine seedling growing in soil of pH 2.4.
Right.—Normal root system.

number of deaths. In an experiment designed to find out the effect of sulphur on the hoop pine seedlings, it was found that there was no white grub damage in the treated plots, whilst untreated plots adjacent to these had suffered badly, the losses exceeding 50 per cent.

It has been suggested that the effect is due to the hydrogen sulphide which is generated in the soil after the application of sulphur and which is present for a number of weeks. The gas is presumably distasteful to the beetle larvæ and acts as a soil fumigant, driving them away. The acidity change would not seem likely to be the cause, owing to the fact that white grubs of various species are found in most soils, whether acid or alkaline in nature. The sulphur dressings had no deleterious effect on the vigour of the hoop pine seedlings. In fact, the treated plants had better root systems with more abundant lateral development.

Effect of Excessive Sulphuring on Hoop Pine Seedlings.

The low pH value of 2·4 recorded at Wongabel and mentioned previously resulted in the development of a characteristic root system on the hoop pine seedlings growing in the affected soil (Plate 185). The lateral roots were dwarfed and tuberous and formed small nodules on the main root. Below the zone of excessive acidity, however, which ceased at a depth of approximately 6 inches, the root system grew normally, pH values determined at that depth being normal for that soil. Numerous plants in the treated beds died, apparently before being able to develop a root system below the zone of excess acidity.

The Effect of Sulphur Treatment on Plantation Pinus tæda.

At Beerwah, in connection with experimental investigations concerning "needle fusion" disease, an experiment was carried out involving the application of sulphur and ground limestone treatment to a plantation area. A dressing of half a ton of ground sulphur per acre as a surface broadcast reduced the pH value from 5·7 (control) to 4·9, whilst a similar treatment with ground limestone increased the pH to 6·2. Height increments of the trees in the different plots varied with the treatment, and will be discussed more fully in a later publication, but it was obvious that the sulphur treatment increased height growth, whilst the limestone treatment depressed it as compared with the untreated controls. This case also illustrates the fact that the optimum acid requirement of the conifers in question is quite considerable.

Isolation of the Queensland Sulphur-oxidizing Organism.

In order to compare the natures of the organisms responsible for the oxidation of sulphur at Yarraman and Wongabel, it was decided to attempt isolations from both nurseries concerned.

One-gram portions of soil from sulphur-treated beds at Yarraman and Wongabel were placed in 300-c.c. flasks, each of which contained 100 c.c. of a medium prepared according to the formula of Waksman (1922), and which was made up of the following constituents:—

Ammonium sulphate	0·2 gm.
Monopotassium phosphate	3·0 gm.
Magnesium sulphate	0·25 gm.
Calcium chloride	0·25 gm.
Ferrous sulphate	Trace.
Sulphur (powdered)	10·0 gm.
Distilled water	1,000 c.c.

The sulphur was weighed out into the individual containers at the rate of one gram to each flask. The flasks were steam-sterilised on each of three successive days at atmospheric pressure. The reaction of the medium was adjusted to a pH value of 4·0.

After inoculation, the flasks were incubated at 26°C. for seven days, when each flask was subcultured by transferring a platinum loop full of medium into a fresh culture flask. The cultures were examined microscopically and were found to contain a variety of organisms. Acidity determinations were made on each flask before subculturing in order to ensure that only flasks in which the sulphur bacteria were active were being dealt with. The process of subculturing was continued each week for five weeks when relatively pure cultures of organisms which increased the acidity of the medium were obtained.

The cultures were then plated out on thiosulphate agar and individual colonies subcultured again into fresh liquid media. In this way pure cultures of a sulphur-oxidising organism from each of the localities in question were obtained.

The two isolations were similar in appearance microscopically, and had the following characteristics:—

A short bacillus with rounded ends.

Length 0·5–0·8 microns.

Thickness 0·25–0·4 microns.

Motile with a single polar flagellum.

Gram negative.

The organism appears to be more closely related to *Thiobacillus trautweinii* than to any other named organism, and is definitely different from the species isolated in the Southern States (Rountree, 1933). For comparative purposes, this organism and other more closely related species are compared in Table 6.

TABLE 6.

CHARACTERS OF SOME THIOBACILLI.

Species.	*Thiobacillus* n.sp. Queensland.	*Thiobacillus trautweinii.*	*Thiobacillus thiooxidans.*	*Thiobacillus* sp. (Rountree).
Dimensions	0·5 — 0·8 × 0·25 — 0·4u	1·3u × 0·4u	1u × 0·5u	2·3u × 0·4u
Staining	Gram — ve	Gram — ve	Gram + ve	Gram — ve
Motility	+ +	+ +	±	
Limiting pH values	1·9 — 9·0	5·7 – 11·5	2·8 — 4·0	4·5 — 8·6

From the differences observed, it would appear that the organism isolated from the Yarraman and Wongabel soils is distinct from that found by Rountree in the Renmark area in the Southern States of Australia, and also from other previously described species, and is accordingly thought to be a new species.

In pure culture in a liquid medium it was found that the Queensland organism reduced the pH value to a minimum of 1·9, which is approximately equal to that brought about by *Thiobacillus thiooxidans,* and it

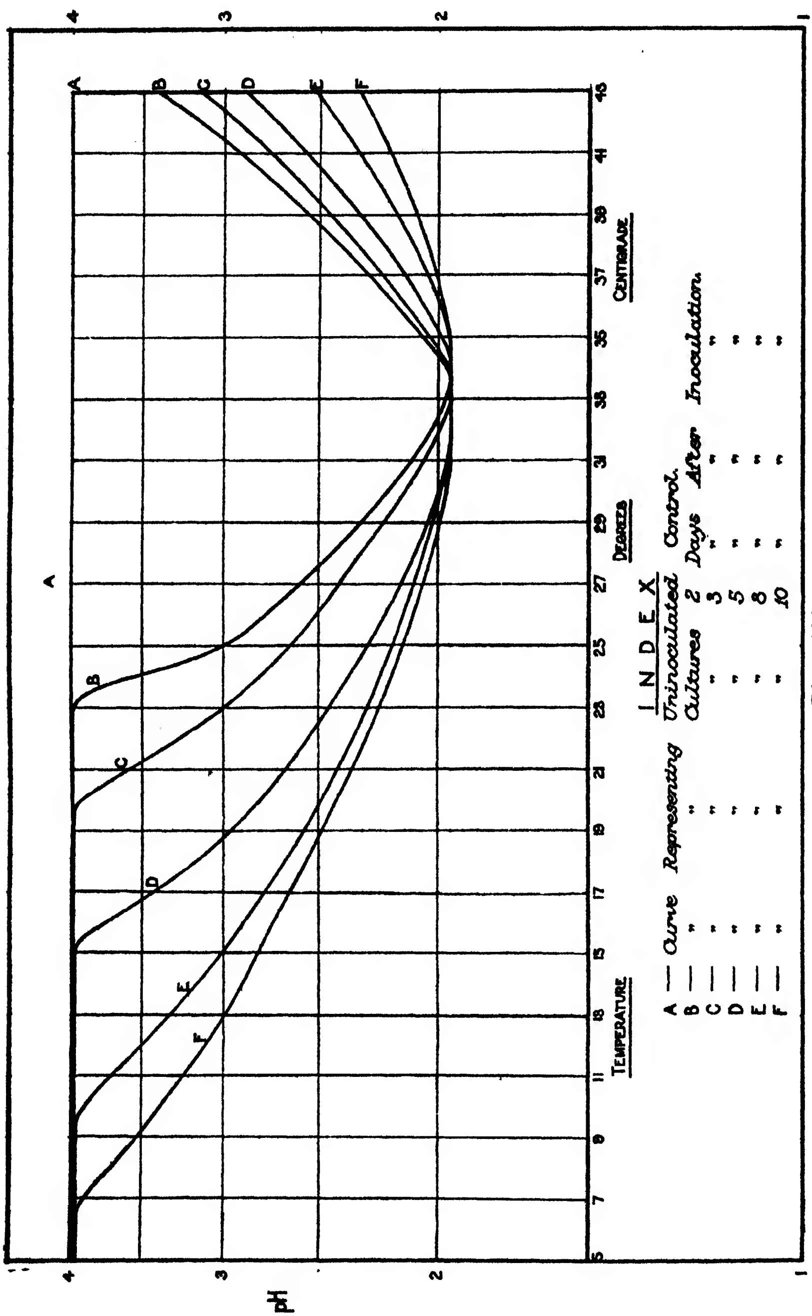


Plate 186.

Graph illustrating the relationship of pH time and temperature for *Thiobacillus* sp.

was found that the species could exist at pH values up to 9·0, which is higher than that for other species except *Thiobacillus trautweinii*, which can tolerate pH values up to 11·5.

The Effect of Temperature on the Activity of the Queensland Thiobacillus.

The temperature relationships of the Queensland organism were worked out, using pure cultures in the liquid medium of Waksman mentioned above. Cultures were placed in a multiple temperature incubator which provided a range from 5°C. to 43°C. distributed over twenty chambers. Daily pH determinations were made and the results plotted to form the graph shown in Plate 186. In the graph each curve represents the pH value found at all of the temperatures in the range at that particular time after inoculation, for which the curve has been drawn. There was no action at any temperature in the first twenty-four hours after inoculation, as is shown in the curve marked A; but after two days a definite increase in acidity had taken place at some temperatures, as indicated by the curve marked B. It will be noted that the acidity had reached a minimum pH value of 1·9 in the two days, and that this minimum was reached most quickly at a temperature of 33·6°C., which therefore corresponds to the optimum temperature requirement for the organism.

At longer periods after inoculation—as, for example, at 2, 3, 5, 8, and 10 day intervals—it will be seen that the same minimum pH value of 1·9 was reached at lower and higher temperatures than 33·6°C. It is shown that within the limits of the experiment the lower the temperature the longer the interval after inoculation at which activity of the sulphur bacteria commenced. For example, two days after inoculation activity had just started at 23·0°C., and ten days after inoculation activity had started at as low a temperature as 6·4°C.

From the trend of the curve at 43°C. it would appear probable that the organism is capable of activity at a temperature higher than that allowed for in this experiment. Thus it will be seen that *Thiobacillus* n. sp. is able to actively exist at comparatively high temperatures such as often occur in the surface layer of the soil, and that it is also active at lower temperatures such as occur in the winter, but that quicker action takes place the nearer the temperature of 33·6°C. is approached.

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The Spread of Ephemeral Fever (Three-Day Sickness) in Australia in 1936-37.

H. R. SEDDON, D.V.Sc.

Following is an abridgement of a paper presented by Professor H. R. Seddon, D.V.Sc., of the Faculty of Veterinary Science, University of Queensland, and Veterinary Adviser to the Department of Agriculture and Stock, Queensland, to the annual general meeting of the Australian Veterinary Association, May,* 1938:—

UNTIL the events recorded in this paper, there was no evidence of the existence of ephemeral fever in Australia. For this reason and because the malady spread widely through Queensland, it is of some interest to record its progress, particularly as nowadays cases of introduction of an exotic disease are rare, and, when they do occur, the natural spread is limited by the application of quarantine or other control measures.

It is known that the disease occurs in many countries of Africa, Palestine, India, Japan, and Sumatra.

The disease was probably introduced to Australia by infected insects.

Whilst incoming aeroplanes are sprayed for the destruction of insect life, usually at their last place of call before crosing the Timor Sea and landing at Darwin, they must be considered a posible means of introduction. The disease, however, does not seem to have spread from Darwin or other aerodromes in North Australia, and what now seems likely to have been its starting point was a considerable distance from any aerodrome.

The other possibility seems to have been accidental insect introduction from some boat trading between these northern islands and the Australian coast. This sea traffic is fairly extensive and varied in character—*e.g.*, mail steamers, cargo boats, pearling and trochus-shell luggers and sampans.

Location of First Outbreak.

The location of the first outbreak cannot be stated. The first official records are for three widely separated centres, one being in Western Australia, another in the Northern Territory, and the third in Queensland. The districts where these centres are located and the dates of the outbreaks are:—

Western Australia—Kimberley district, 15th March, 1936.

Northern Territory—Humbert River district, February, 1936.

Queensland—Gulf country, early in March, 1936.

The actual date of the commencement of the disease in each of these areas also cannot be stated definitely, and from such evidence as is available it would appear that these three outbreaks were not very widely separated in point of time.

It may be wondered why the earliest appearance of the disease would not necessarily be discoverable, but in this connection there are

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several important features to consider, some of these being bound up with the system of cattle husbandry which, because of the incidence of the rainfall, has to be practised in Northern Australia.

The system of animal husbandry practised in these northern cattle areas does not call for close supervision, and as a general rule cattle are seen only about twice a year, once for mustering fat and store animals for southern markets, and later in order that the young may be branded, and the musters are far from complete. More important, perhaps, is the fact that no cattle operations are undertaken in the "wet" season—only in the "dry."

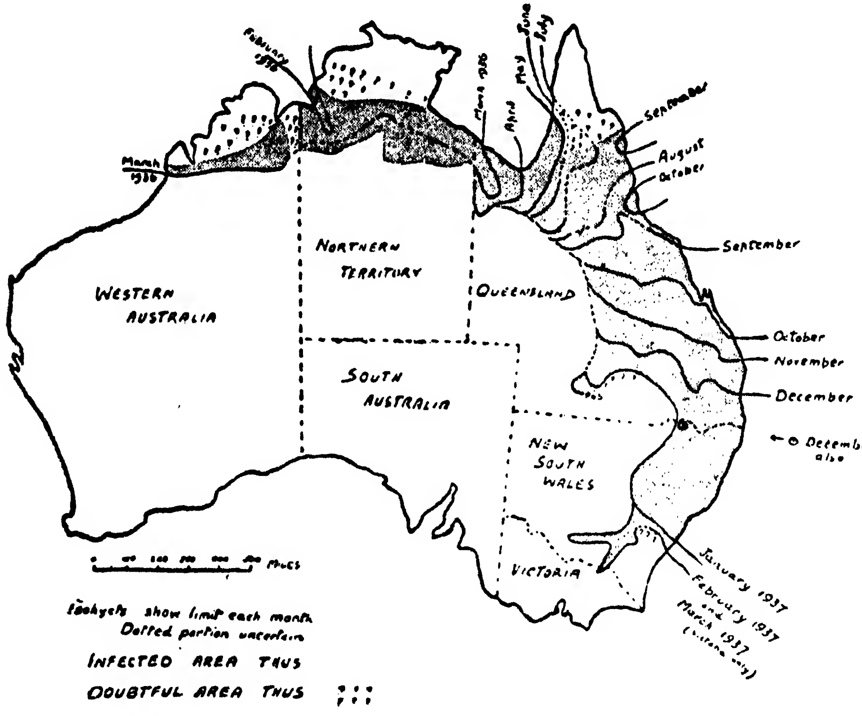

Plate 187.

Distribution of Ephemeral Fever in Australia to March, 1937 (end of primary invasion). NOTE.—Not all places within monthly limit lines became affected during that month.

Small wonder that a disease hitherto non-existent there and therefore of a type not known to stockmen should escape notice, particularly in view of the facts that it is evanescent in character, its duration in a herd being merely a matter of a few weeks, and that, as it causes practically no mortality in station cattle, there would be no serious shortage at a subsequent muster and few carcases to mark its path. Even so, the chance of early detection was considerably lessened by reason of the probability that it first occurred during the wet season.

The evidence suggests that the disease appeared early in February, 1936, in the north-western portion of the Northern Territory, near the mouth of the Victoria River, and that it spread in both easterly and south-westerly directions to the Queensland and Western Australian borders respectively.

During 1937 only a few cases of the disease were reported from the Northern Territory, all in the Gulf country, and immediately following the wet season.

Distribution of the Disease.

The earliest reported cases (in Queensland) were in what is known as the Gulf country—*i.e.*, the lands to the south of the Gulf of Carpentaria—this being held in large cattle stations, sparsely stocked and very sparsely populated. As a result of extensive inquiries made later by Mr. C. R. Mulhearn, Acting Director, Animal Health Station, Townsville, and field officers working under his direction, it would appear that the first observed cases occurred during the month of March on three separate stations—two within 30 miles of the Northern Territory border and the third a little further east. The date of the appearance on the most easterly one of these stations is given as 18th March, 1936, and of a station to the west of it as "beginning of March."

The following month (April) the disease was seen on stations to the east, and one to the south, of those previously affected, extending further east and north-east, through the country on the eastern shore of the Gulf, during the ensuing month (May).

In June and July cases occurred on other properties, but only five outbreaks are recorded for these months, the disease disappearing from areas previously affected. This extension was to the east and south-east, and by then the disease had spread half-way to the eastern coast of Queensland, so that it was no wonder it reached there at the nearest point (Cairns) during August. The disease now spread more rapidly and extended south-east, each succeeding month finding it in more southerly districts until in January, 1937, it reached the southern border of Queensland.

During the latter part of 1936 sporadic cases occurred in North Queensland, chiefly affecting herds or animals which had escaped the visitation earlier in the year.

The number of cases increased somewhat in January and February, 1937, in North Queensland. The disease apparently died out during mid-winter, but sporadic cases occurred in various parts in the following spring.

The first appearance of the disease in New South Wales was apparently in the middle of December, 1936, on a property near the Queensland border and nearly 200 miles from the coast. Curiously enough, the nearest centre in Queensland at which the disease was recorded during that month was some 90 miles further north, and it was believed that it did not reach the border near the New South Wales outbreak until January, 1937.

In January, 1937, the disease appeared in various parts of the eastern third of the State, as far south as Sydney, being present on north and central coast, northern and central tablelands, north-west and western slopes and part of the north-west plains.

The following month (February) it extended southwards and was recorded from several centres in the eastern half of the southern portion of the State, with the exception of the far south coast and portion of the southern tablelands, and in a northern district where cases had not occurred during the previous month.

Its incidence in the northern coastal districts seems to have been much the same as in the neighbouring parts of Queensland, but as it extended southwards this became progressively lower.

In Victoria the incidence on affected properties was even lower, and not more than three animals were affected on any one holding.

The first case occurred in the Wodonga district on 11th February, the disease then being present across the New South Wales border at this point. Subsequently it was definitely diagnosed on eleven properties between Wodonga and Wangaratta, all in a relatively small area, the last case occurring on 22nd March, less than six weeks after the discovery of the first case in this State.

It will thus be seen that the disease never assumed serious proportions in Victoria, and it is significant that on the first property involved only three animals became affected although there were some hundred head on the holding.

The earliest recorded outbreaks were in the Northern Territory (February, 1936), but as the disease occurred then at two places over 100 miles apart, it is probable that the first cases in the Northern Territory were actually earlier. It was probably present in Western Australia also during February and possibly may have been present in Queensland also, though careful inquiries have failed to establish its presence during that month.

Reviewing its spread in Queensland, which is in general now known, it would seem most probable, seeing that it travelled east or south-east in the Gulf country, that it came in from the Northern Territory.

If ephemeral fever moved in the same way in the Northern Territory, it seems reasonable to assume that it traversed the Territory from west to east, with probably a south-easterly trend.

A very important observation by Mulhearn has been the occurrence of the disease on islands off the coast of Queensland. In the cases investigated, the islands have been distant one, several, and in one case 20 miles from the nearest part of the mainland, with no introduction of cattle or other farm animals for many months—*i.e.*, only prior to the first recognition of the disease in that part of the State. These cases have occurred at the same time as, or a little later than, the disease was present on the neighbouring mainland. In some cases regular tourist launches have been plying between the islands and the mainland, but in other cases there has been no such regular service. As the disease moved south all islands off the Queensland coast on which cattle were depastured became affected.

The disease has occurred on many isolated *inland* properties in Australia—*i.e.*, farms situated deep in valleys in mountainous country or clearings surrounded by forests where the immediately surrounding country for several miles has not been stocked. Such cases have occurred, however, only immediately following the occurrence of the disease in the nearest pastoral country.

Probable Natural Method of Transmission.

Investigations in Australia and abroad have shown clearly that ephemeral fever is not spread by simple contact. It is, however, readily conveyed by inoculation, even minute amounts of blood from an affected animal setting up the disease (Mackerras).

These facts suggest that the common mode of transmission is by some insect vector, and the spread of the disease to animals isolated by water suggests that it is some insect vector capable of travelling by air, —*i.e.*, some flying insect.

The spread of the disease across several miles of water, its introduction into herds miles away from other stock, and the fact that the disease "jumps" rather than spreads, appearing here to-day and 10 miles away in a day or so, without affecting intervening stock, suggests that such an insect may be spread by other than natural flight—*i.e.*, by wind.

The question of an insect transmitter has been the subject of investigations by Roberts in this State and by Mackerras and his co-workers at Canberra, but up to the present it has been possible neither by ecological studies to suggest the actual insect that may be involved nor by experiment to show that any of the insects tested are capable of transmitting the disease.

Nevertheless, there are grounds for believing that some type of biting fly is responsible for the transmission of the disease.

The Spread of Ephemeral Fever.

Even though one accepts insect transmission as the natural means of spread, there are certain other features which at least merit mention, if not discussion.

(*a*) *Spread of the disease by travelling cattle.*

Two possibilities exist:—

(i.) Spread by cattle then affected with the disease.

(ii.) Spread by recovered cattle.

There is considerable evidence that the disease spread in the entire absence of cattle movement. During February and early March it would be the wet season in the Northern Territory and droving of cattle would be impossible. Yet the disease spread just at that time.

A little later—*i.e.*, with the onset of the dry season—there were extensive movements of cattle west, south, and east from the Territory and south, south-east, and east from the Gulf country of Queensland. Actually, in the latter locality the disease was first recognised when stock were being mustered for dispatch to market; it was the lameness of such cattle, causing inability to travel, which first led to its detection. Though these movements in April, May, and June were extensive, and many cattle must have been sent from areas where the disease had recently occurred, careful inquiry showed that it was not thus spread to areas which these cattle finally reached. Many of these cattle were sent by rail and so would reach destinations on the eastern seaboard of Queensland in a matter of a few days; yet the disease did not occur there until months later.

There remains, however, the possibility that movement of cattle in which the disease was then present may have facilitated the spread of the disease. This is considered to have occurred in at least one instance in Queensland, but only when they were taken to an area where conditions otherwise were such that the disease was capable of then spreading there.

A consideration of the evidence therefore leads to the conclusion that whilst cattle movement may facilitate spread of ephemeral fever, it was not the prime factor in the dispersal of the disease.

(*b*) *Cattle population and distribution of the disease.*

Reference to the map on page 602 and what has previously been written regarding the occurrence in the several States which became infected shows that the disease occurred only in portions of these States.

In Northern Australia much of the unaffected area is not stocked, but a large part carries a cattle population equal to, and in some cases denser than, that in the affected areas. In southern New South Wales and in Victoria there is a large cattle population in districts contiguous to those affected, and in the more southerly portion, moreover, the disease apparently failed to attack more than a small percentage of the animals in a herd, as against from 75 to 100 per cent. in the north.

For these reasons, it may be concluded that the mere presence of cattle in areas contiguous to an infected area, even when the incidence in that affected area was high, was not sufficient to ensure the spread of the disease, and that the distribution of the disease was limited by some factor other than absence of the susceptible host—viz., cattle.

(*c*) *Other factors which may have limited the spread of the disease.*

A consideration of all affected areas where the incidence of the disease as to properties and as to individuals of the herd was high—*i.e.*, all parts except southern New South Wales and Victoria—shows that the non-affected areas abutting on them have a lower rainfall, except in the case of certain unstocked country on the northern coast.

It appears certain, however, that in no part of Northern Australia did it occur in one area and not in a contiguous stocked area when the *recent* rainfall in the latter had been greater than in the former, unless that area was so placed that the disease had to pass over the lower rainfall area before it could get to the higher rainfall area.

The limit of the affected area in Queensland in general approximates that of the 20-inch line of rainfall for 1936. No particular significance can be assigned to this figure, however, for the disease has appeared in parts of Northern Australia in which the rainfall for that year was only 10 inches.

Fuller consideration suggests that the determining factor is quite probably what might be termed "effective" rainfall. This might well be only *recent* rains, when probably 2 or 3 inches would suffice. Further, other climatic factors such as temperature probably exert considerable influence.

Such evidence as is obtainable suggests that the relative lack of surface water may have been a limiting factor in the distribution of the disease, and climatic influences associated with onset of winter responsible for its gradual decline, and even its disappearance, temporarily if not permanently. These conditions support the suggestion of an insect vector.

(*d*) *Is the vector an introduced one?*

The fact that the disease occurred for the first time in Australia early in 1936 might suggest that the vector was one introduced about that time.

There is no evidence, however, of the appearance and rapid spread of any hitherto unrecorded biting fly, particularly an exotic one, appearing first in the north and then spreading through the area to which the disease subsequently gained access. In all probability the initial entry was by some introduced *infected* vector, but it would seem that thereafter its spread was by an insect indigenous to Australia. It is understood that there are several types of indigenous biting, winged insects (particularly mosquitoes and sandflies) which have a wide distribution in Australia, some, in fact, a distribution akin to that taken by ephemeral fever, and, further, that some of these occur also in islands north of Australia.

The southerly spread of the disease along the eastern coastal portion of Queensland, commencing in the north during the early spring (September), suggests the action of some vector breeding locally and emerging in more southerly latitudes as the weather became warmer. This is supported by the relative quiescence of the disease in the north during the colder months there (June to August) and its final disappearance in Victoria with the onset of autumn.

(*e*) *Absence of vector the limiting factor in distribution.*

On such an assumption the absence of the disease from the more inland parts of North Australia, south-western Queensland, western New South Wales and most of Victoria becomes understandable, for it may well be that climatic conditions in these areas would be unfavourable to such insect life. We know that such factors limit the occurrence in Northern Australia of piroplasmosis (tick-transmitted) and onchocerciasis (probably conveyed by a sandfly).

Support for such a suggestion comes from a report by Mr. Mulhearn that on one station in the Winton district, Central Queensland, the disease did not appear until after a flood in a river passing through the property, and that mosquitoes, rare prior to the flood, became very numerous following it.

(*f*) *Is any other factor involved?*

Assuming that ephemeral fever is spread by a local insect vector and that cattle movement plays no constant part, can one assume that the spread was entirely by insects transported by their own powers of flight? Against this we have:—

(1) Its apparently simultaneous appearance at two centres nearly a thousand miles apart, the disease having apparently been in Australia only a few weeks and almost certainly not more than two months.

(2) Its known rapid spread (*e.g.*, in Queensland, from 200 to 300 miles a month).

(3) The fact that, in general, an insect, even a flying one, does not tend to roam extensively from its local breeding ground.

(4) The spread across the sea to islands up to 20 miles off shore.

(5) The spread of the disease by a series of "bounds" or "jumps" rather than a progressive invasion from farm to farm.

For these reasons, and from the well-known fact that certain types of flying insects are liable to be wind-driven, it has seemed profitable to consider how far the prevailing winds may have assisted the spread of

ephemeral fever and whether these would have lead the disease to take the directions it did.

To attempt to trace this influence on its whole line of spread would be tedious, and consideration will therefore be confined to:—

(*a*) Its dissemination in Northern Australia in February-March, 1936, and

(*b*) Its later spread southward along the Queensland coast during October-December, 1936.

February-March Spread.

During this period of the year the northern coast is subject to the north-west monsoon; according to information supplied by the State Meteorologist for Queensland (Mr. A. S. Richards), between Wyndham and Cape York the prevailing wind on 70 per cent. of days would be from the north-west, and that on reaching Australia this would be broken by local storms and cyclonic influences. Further, from an area to the north-west of Daly Waters this wind would be directed to the *west,* blowing from the Victoria River district (where the disease first appeared) across the Kimberleys to Broome (*i.e.*, traversing the district in Western Australia where the disease occurred). A north-west wind also prevailed during February and the first four days of March along the southern shores of the Gulf of Carpentaria, and towards the south-eastern corner of the Gulf this wind would tend to turn south. From one of the three properties in Queensland first affected it is recorded that the disease coincided with the prevalence of northerly winds and that it spread south over the property.

If, therefore, the disease did first appear in the northern part of the Northern Territory and its dissemination were in any way dependent on wind movements, its spread to the west (to Western Australia) and to the east (to the Gulf country of Queensland) would be in accordance with these wind movements.

October-December Spread.

During this period the coast, from Townsville southwards, received a regular north-easterly afternoon wind and further inland northerly winds in general prevailed. Several officers have reported that the appearance of the disease has followed strong winds from the direction in which the disease was earlier present.

It is felt that whilst proof is lacking these wind movements are at least suggestive.

How far such an insect vector could be entirely wind-borne one does not know, but though the north-westerly monsoon blows strongly from the islands to the north of Australia, it would seem unlikely that it alone could be responsible for the transport of infected insect vectors to Australia. Much more likely they reached the shores of Australia in some craft, either sea or air vessel, in which they had sought shelter.

Conclusions Regarding Manner of Spread.

These may be summarised as follows:—

1. The disease is not spread by contact *per se* (experimentally it can be transmitted only by blood inoculation).

2. Whilst the disease may spread from holding to holding in contact, it frequently "jumps," and may next appear some miles away.

Nevertheless, the progress of the disease in eastern Australia was in the nature of a steady southerly advance each month, the forefront of this being well defined and so capable of being represented geographically except in one instance (New South Wales, December, 1936). This New South Wales outbreak, confined to a single property, may have been an excessive "jump," or, perhaps, due to rail transit of affected stock from Queensland.

In two cases in North Queensland, the disease did not reach certain coastal districts until after coastal regions on either side of them; hence the "loops" for September (Daintree) and October (Ingham).

3. The disease is ordinarily spread, not by movement of affected cattle, but by some other agency capable of crossing several miles of water.

4. Although affected cattle cannot ordinarily travel by road because of the weakness induced, the fact that inapparent infections are now known to occur would suggest that the disease may "smoulder" in a mob, so that on reaching another district a new centre of infection may be set up. A centre of infection might also result from affected cattle being travelled by rail.

Since only rarely has infection been spread from such a centre, the conclusion is that such movements are dangerous only when some other agency is present at that centre to disseminate the disease.

5. Aerial conveyance of the virus itself is improbable for the following reasons:—

(*a*) There is no knowledge of the escape of the virus from an infected animal into the atmosphere;

(*b*) The non-infectivity of simple contact; and

(*c*) The non-spreading of the disease to cattle in certain contiguous districts.

6. The above strongly suggest the necessity for some insect vector capable of flight.

7. There is no evidence of the introduction into and the dispersal in Australia of such an exotic vector; in all probability, some local insect was responsible for the spread of the disease.

8. The southerly spread of the disease during spring, 1936, and summer, 1936-37, suggests that this coincided with the emergence of insects breeding locally.

9. The failure of the disease to spread to certain inland areas of lower rainfall than neighbouring districts at that time affected, and to certain southern districts, suggests that climatic conditions in these parts were not adequate for the insect vector.

10. The lessened incidence and gradual disappearance of ephemeral fever in southern Australia also suggests that climatic influences determined its limitation.

11. In view of the propensity of the disease to "jump," and in the light of its very rapid spread in North Australia and the direction of that spread, it is suggested that the insect may be wind-driven by prevailing winds.

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Soil and Plant Interrelationships as Demonstrated by Soil Analysis.*

C. R. VON STIEGLITZ.

THE term "soil analysis" is heard so frequently, in reference to fertility investigations, that the uninitiated may be pardoned for concluding that this represents a certain fixed technical examination to which all soils are subjected, whatever the problem. It is also frequently assumed that such treatment will supply the complete answer to all soil problems, however complex. Unfortunately no method capable of yielding such spectacular results has yet been evolved, and the method to be adopted must be chosen to fit the problem. A soil analysis designed to give the "total" amounts of the various chemical substances comprising the soil complex, whilst of interest and help to a soil chemist in specialised investigations, tells nothing necessarily of the fertilizer requirements of the soil under investigation.

Special methods have been devised from time to time to determine what are called the "available" soil plantfoods, but although such methods in the past furnished results which separated soils of very high from those of very low fertility, little success attended the efforts to base fertilizer advice on the analytical findings.

This failure can be attributed to two main causes—

1. The fertilizer field trials, with which the analytical results were compared, were themselves unreliable, and
2. The sample submitted to the soil chemist for analysis was frequently not a true representation of the field under examination.

With the advent of statistical methods and their application to fertilizer field trials the outlook was completely changed, and it is now possible to carry out such trials confident in the knowledge that the results obtained will accurately assess the plantfood needs of the field under examination. Such an advance in field experimentation has supplied the chemist with that reliable information of the soil's reaction to fertilizer treatment which he previously lacked, and has paved the way to establishing a definite relationship between laboratory methods designed to show quantities of "available" plantfoods and the results of fertilizer field trials.

It has been possible also to devise new and less time-consuming laboratory methods, and to assess correctly their usefulness as a guide to fertilizer applications. During the past ten years the Bureau of Sugar Experiment Stations has been conducting scientifically designed field trials on selected farms on all the major soil types of the sugar areas. Such trials, however, are time-consuming and expensive, so that the desirability of obtaining similar results by reference to a soil analysis is obvious.

With this object in view, soil samples were taken from the "no fertilizer" plots of all experiments and analyses for plantfood availability carried out in the Brisbane laboratory by methods developed by the Bureau. By this means it has become possible to establish a good

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for October, 1938.

working relationship between the results from the field trials and the laboratory methods.*

Such a relationship, however, only exists when the sample for analysis is truly representative of the field under consideration and is taken during a definite period of the crop rotation. This correlation which has been established is based on the analysis of *samples taken just prior to or immediately after the harvesting of the plant crops of cane.*

A sample obtained at this period approximates most closely to the average state of the available plantfoods during the rotation.

It is a generally accepted fact that during fallow fresh soil particles disintegrate and decompose, and the supply of available plantfood, which has become depleted through the demands made upon it by the growing crop, is partially restored. Particularly is this so where a green manure crop has been ploughed under and allowed to decompose, thus helping to aerate the soil and supply the soil bacteria with the necessary energy to fulfil their function in building up anew the nutrient supply. The supply of nutrients, however, which is built up in this way, may be only transitory in nature and will largely disappear when the growing crop exerts its full influence. It will therefore be readily appreciated that soil samples for analysis taken immediately after a fallow period, are likely to give an exaggerated idea of the fertility of the soil, whereas one taken at the end of the first big growth period will express more nearly the power of the soil to supply plantfoods continuously.

Experiments on sampling carried out by the Bureau during the last three years have demonstrated that fields which appear uniform to the observer may vary very considerably from point to point in available plantfoods; and they have also shown how essential it is to exert the utmost care in sampling if the subsequent analysis is to mean anything. The Bureau will test soils for cane farmers free of charge, but any person submitting samples for analysis and fertilizer advice must endeavour to supply a sample which is as nearly as possible a true representation of the field in question.

It must be stressed that the instructions given below for the number of sub-samples which should be taken to form one composite is the minimum necessary; only good would result from increasing the number two or three times.

Procedure for Taking Soil Samples.

A post hole digger is one of the most convenient implements with which to sample the soil, as this removes a complete portion in one operation. An ordinary 1½-in. auger is good, provided the soil is sufficiently moist to cling to it firmly. If these implements are not available, a square hole should be dug to a depth of 10 in. (plough depth) and after cleaning out the loose earth, a slice about 2 in. to 3 in. thick taken down one side from top to bottom. Such a sub-sample should then be placed on a clean bag or piece of canvas. Other sub-samples (of approximately similar weights) should be taken from other portions of the field and added to the first one on the canvas; all should be mixed thoroughly before making the final sample, which should approximate

* These results have now been compiled by Dr. H. W. Kerr and the writer, and have been published as a Technical Communication of the Bureau.

2 lb. The number of sub-samples which should be taken and mixed in order to obtain such a representative sample will depend on the apparent variability of the soil and size of the field. At least three samples should be taken and composited for the smallest area. For large areas at least one sub-sample per acre is required.

Soils which appear markedly different must never be mixed, but each sampled for separate examination. Slight differences in colour, however, may be disregarded. *Fallow land should not be sampled except for special investigations.*

Notes should be recorded as to the type of sub-soil—e.g., sand, clay, &c.—and whether the area in question would be likely to benefit by artificial drainage, and these notes despatched, when the soil sample is forwarded to the—

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Department of Agriculture,
Brisbane.

Samples should be taken from the middle of the interspaces just prior to or immediately after harvesting the plant crop but before fertilization for the ratoon crop.

A HANDY TROUGH FOR PIGS.

A very handy trough for feeding pigs or calves can be made out of a kerosene tin. The tin should be cut diagonally (as shown in Fig. 1), leaving the edge AB uncut, and then opened out, forming two wedge-shaped troughs side by side. A box frame should be made of the right dimensions to hold these troughs, and a centre piece let in on the upper edge CD (Fig. 2). The uncut edge of the tin must be placed over CD, the troughs lying on each side of the box frame. By cutting a nick at each corner the edge of the tin is bent over the edge of the box and tacked down.

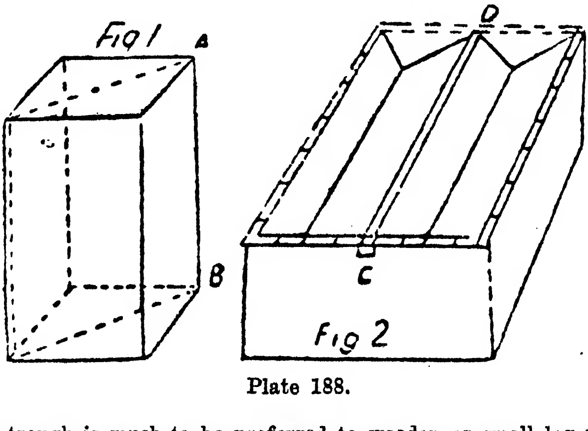


Plate 188.

This class of trough is much to be preferred to wooden or small log troughs or old fruit-case or butter-box troughs, for the reason that it is more permanent and can be scalded out daily, and thus be kept in a clean sanitary condition. If the trough is affixed to a wide board or floor, say, 3 ft. square, it will be impossible for young pigs to upset its contents, and if moved on to a fresh site occasionally will be found exceptionally handy, particularly in wet weather.—E. J. Shelton, Instructor in Pig Raising.

Some Factors influencing Cane Production.*

H. W. KERR.

Introduction.

IF we could provide those conditions of soil plantfood and moisture which would maintain continuous cane growth at its maximum rate, it would be possible to produce crops very much in excess of the best Queensland production levels at present recorded. In a small experiment in North Queensland which received almost continuous irrigation and frequent fertilizer applications, a plant crop at 18 months old yielded over 140 tons of cane per acre; even in the southern areas, where the "growing" season is much shorter, it is possible to grow 100 tons of cane per acre, under similar conditions. Whilst admitting that no cane grower desires to produce on a field scale crops of this magnitude, which would probably become hopelessly lodged and rotted, it is well to remember that a 45-ton crop of cane, though pleasing to the farmer, by no means represents anything like a *maximum* yield; and the farmer who cannot average better than 20 tons per acre should be certain that there probably exist serious limiting factors, in his farming system, which it may be possible to overcome or eliminate, with consequent benefit to himself.

It is then of interest to record the several major factors which are involved in plant growth and to indicate briefly the steps a farmer should take both to investigate causes of crop limitation, and to eliminate them.

Factors in Crop Growth.

The following are the most important soil factors affecting plant growth:—

1. Water supply.
2. Air supply.
3. Temperature.
4. Supply of plantfoods or nutrients.
5. Various injurious factors.

1. Water Supply.—

It has frequently been emphasised—and indeed, it is quite obvious to every canegrower—that sugar cane is a water-loving plant. Water is absorbed by the crop roots, and is evaporated by the leaves of the cane. It has been estimated that in the production of 1 lb. of *dry* material, the cane plant absorbs and evaporates, on an average, about 30 gallons of water. The production of a 30-ton crop of cane therefore necessitates access to about 45 acre-inches of water. If the crop is denied ample soil moisture, growth ceases, and in extreme cases, it may actually perish from drought. It will be evident, therefore, that during rainless periods, the cane crop is able to grow only so long as the soil moisture supply lasts. This will be governed largely by the nature and amount of the rainfall, in replenishing the soil water supply; but it is well known that a "heavy" soil (clay or clay loam) holds moisture better than a "light" or sandy soil, and therefore crop growth is more regular

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for October, 1938.

on the heavier type, because of the superior moisture supply. Moreover, crops growing on heavy soils make more economical use of water than do those on sandy soils.

Where the normal incidence of rainfall is such as to cause serious checks to cane growth, the only satisfactory method of overcoming the trouble is by the artificial application of water. Irrigation practice has expanded rapidly in many of the drier areas of the State in recent years: and wherever good quality water can be brought to the field at reasonable cost, costs of cane production have been reduced very materially.

It has been pointed out from time to time that the humus content of the soil is an important factor governing the moisture retentive power of the soil. Therefore the farmer can attempt to effect some improvement in a droughty soil by ploughing in all crop residues—trash and tops—and green manuring the land when in fallow. Deep working of the land by means of the subsoiler or grubber will also assure the maximum absorption of moisture in time of heavy rainfall, and also permit deep penetration by crop roots to get access to the moisture so stored.

It is also possible to minimise the loss of moisture by evaporation from the moist land surface by conserving trash as a surface mulch in ratoon crops. In a dry year particularly, this has frequently been attended by striking results.

2. Air Supply.—

Though the cane crop roots require an abundant water supply, they must also have air for their healthy growth and development. Without air the roots cannot "breathe," and are unable to perform their normal function of water and plantfood absorption.

It is therefore essential that the farmer pay special attention to the question of land drainage. During heavy rainfalls, the air is temporarily driven out of the soil, and all interspaces between soil particles become filled with water. When the rain ceases, however, it is essential that the surplus water drain freely, so as to restore the desirable condition of an aerated, moist soil.

It is a fact that many of the Queensland cane soils which cause the crop to suffer most in rainless periods, also become water-logged in times of heavy rain. The situation may be improved in a number of ways. An adequate system of surface drainage will enable excess water to be removed from the surface of the land, and relieve the burden of sub-drainage in the soil. But this is only partially effective if the subsoil strata are of such a character as to be impervious to water; under such conditions, the only means by which the excess can be eliminated is by evaporation from the land surface, and this is not satisfactory. The breaking up of hard pan layers and the installation of a system of tile drains is the only satisfactory means of guarding against long periods of waterlogging in such a soil. They are costly, but effective. The mole-drainer may be helpful, but it gives satisfactory results only where the subsoil clay is of suitable character. Deep grubbing or subsoiling has given good results on certain soils, notably where the existence of a compact plough pan is the cause of excessive water retention by the soil.

The farmer should make a careful examination of any fields in which waterlogging occurs, and apply the appropriate remedy, if at all possible.

An over-wet soil may be responsible for just as great crop losses as one which is droughty.

3. Temperature.—

The temperature of the soil (and air) are of importance to cane growth. It has been demonstrated that crop growth is virtually at a standstill, so long as the average daily atmospheric temperature is less than 65°F. This is true, no matter how favourable all other growth

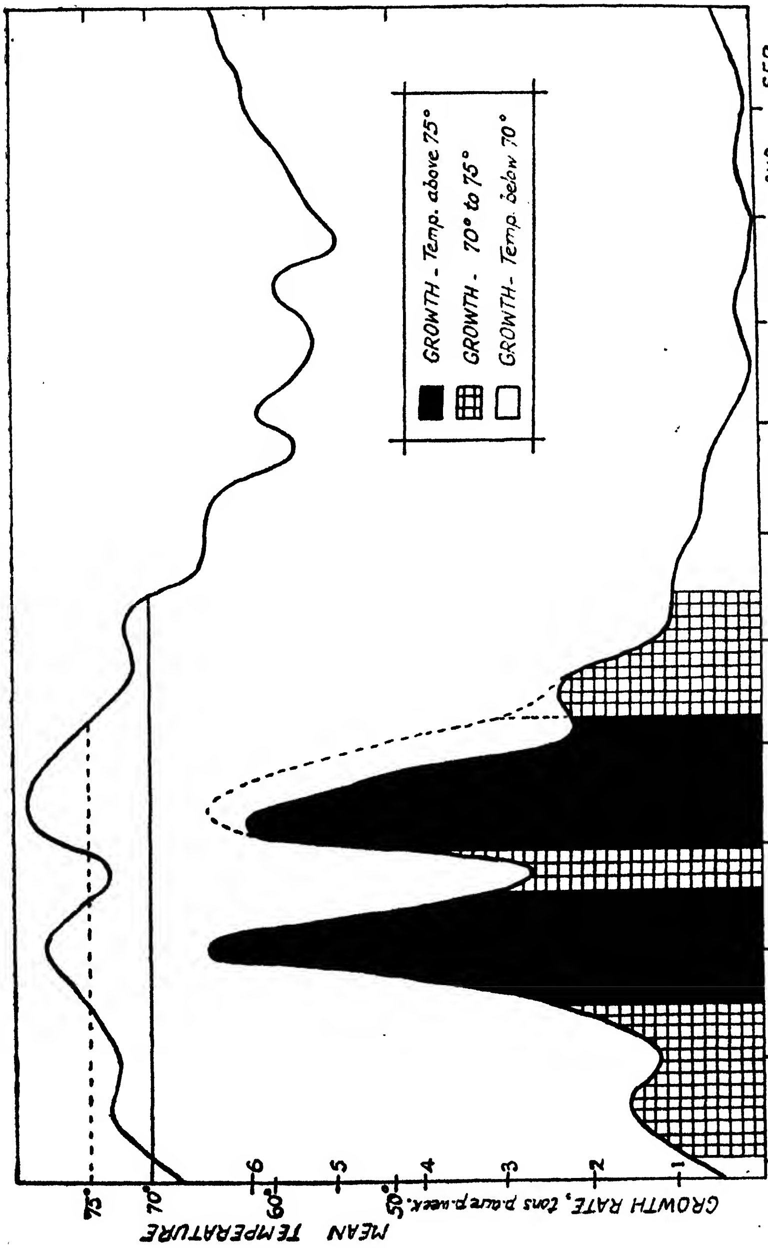


Plate 189.

Illustrating the close relationship between cane growth and mean atmospheric temperature; irrigated cane.

conditions may be. When the mean temperature rises to 70°F., vigorous growth becomes possible, while for temperatures from 75° to 80°F., crop growth can proceed at a very rapid rate. Of course, other factors incidental to temperature enter to modify this generality. Excessively hot, dry winds would result in a high average temperature, but it is known that they tend to distress the crop, rather than favour its development.

On the basis of soil and atmospheric temperature, then, stands the explanation of the longer growing season experienced in the far north, as compared with that in the southern areas; and other things being equal, one should expect potentially heavier cane tonnages per acre in the tropical regions than in the more temperate zone.

A subsidiary factor, which might be mentioned in this connection, is that of sunlight. Though this is beyond the powers of the farmer to modify, it is important to note that for a given mean temperature, cane growth is more vigorous in bright sunshine than in cloudy weather. Moreover, the greater length of the summer day in southern, as compared with northern Queensland, offsets to some extent the handicap of a shorter growing season.

4. Supply of Plantfoods.—

The cane crop develops by the process of manufacture of plant tissues from raw materials which it obtains from the soil and air. The two major raw materials are water and carbon dioxide gas, which are combined by the green colouring matter of plants, in the presence of sunlight, to give first of all simple sugars, which become the building stones from which more complex tissues are constructed. But this process can only proceed so long as the plant obtains its balance of mineral elements and nitrogen compounds from the soil. These are the so-called "plantfoods" which the farmer must jealously guard and maintain in the soil.

Plantfood deficiencies are probably responsible for greater reductions in crop yield than any other factor except soil moisture. This is notably true in the regions of high rainfall where leaching is excessive, and the soils, even in their virgin state, possess relatively poor supplies of these important substances. So long as the land is maintained in permanent cultivation, the liberal use of artificial manures is the only means of maintaining or building up the reserves of the soil. The policy of long fallowing under grass, combined with the growth of green manure crops, is a slower but more economical method of effecting the same result. Doubtless it is a distinct advantage if both methods can be combined judiciously. Crop rotation in itself leads to other benefits which cannot be discussed in detail here, but which have been dealt with previously.

The plantfood requirements of the major cane soil types of Queensland are the subject of continuous investigation by the Bureau, and each year a number of fertility trials are harvested from selected farms in all cane areas. The information thus gained, when applied intelligently, enables farmers cultivating soil of these particular types to purchase those fertilizer mixtures which will give the maximum return for a given expenditure. For more highly specialized advice, an analysis of the soil should be sought. This service is provided at no cost to the canegrower, and if desired, the local Instructor in Cane Culture will visit the farm, on request, and take the necessary samples of soil for the purpose. This is a service which could be availed of much more

completely than it is at the present time. Fertilizers are costly, and the purchase of the wrong balance of foods may lead the farmer into much unnecessary expenditure.

5. Various Injurious Factors.—

There often exist in the soil substances which are actually harmful to the cane crop. One of the chief of these is soil acidity. Due to excessive leaching of lime and similar substances, there develop in certain soils concentrations of acidity which are definitely harmful to the crop roots. Cane normally thrives in a soil with a slight intensity of acidity; but when a certain maximum value is exceeded, the falling off in crop growth proceeds at a rapid rate, while extreme instances have been recorded where cane growth was not possible. The remedy for this trouble is the application of suitable amounts of liming materials—either crushed limestone, earth lime, or burnt lime. The need or otherwise for this treatment can rapidly be determined by a simple test, and growers desirous of advice in this connection should consult the local Instructor, or forward a sample of soil for the purpose to the Head Office of the Bureau, or to one of the experiment stations. This knowledge is important, for it is well recognised that fertilizer applications do not produce the full possible benefits on soils which need liming to destroy acidity.

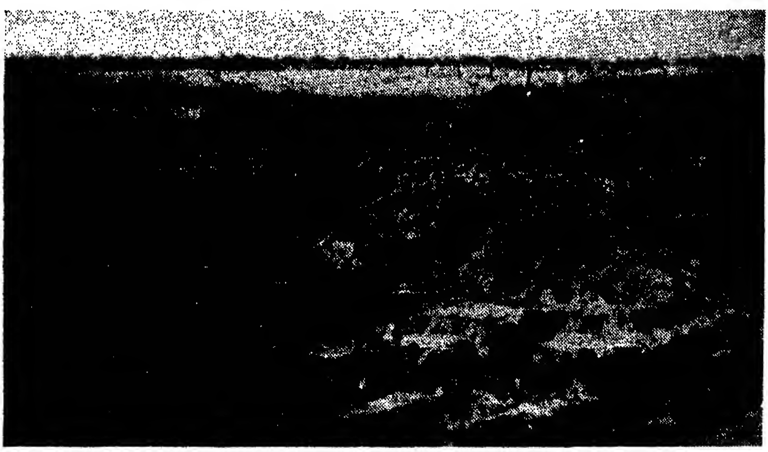


Plate 190.

Illustrating the effects of soil erosion; ten years previously this field produced good crops of cane.

Where irrigation is practised, soils and crops are sometimes damaged due to the presence of harmful salts dissolved in the water. Brackish waters may lead to an accumulation in the soil of common salt, which builds up to such an extent that crop growth is seriously affected. This occurs most frequently on soils which do not possess adequate subsoil drainage. The obvious remedy is either to promote better drainage conditions, or to avoid using waters of excessive salinity. No water should be used for irrigation purposes until it has been analysed by the Bureau, and declared safe. A more dangerous salt which often occurs in the sub-artesian waters of the Burdekin district is carbonate of soda, or "free alkali." This substance is much more troublesome than ordinary salt, and its effects on both soil and crop may be very serious. Water

analysis readily demonstrates the presence of soda, and if the grower is unable to fined a supply free from this ingredient, he should at least guard against permanent damage to the soil by taking the necessary precautions. The use of lime is often helpful in this regard, while applications of gypsum (occurring also in superphosphate), sulphate of ammonia or sulphur will readily overcome the effects of moderate amounts of free alkali.

In certain areas adjacent to the coast, canelands are inundated by high tides, and the salt which remains in the land after the tide has receded and the soil water evaporated, may reach injurious proportions. In such cases, an attempt should be made to prevent ingress of salt water, while lands so damaged may again be restored to a state of fertility when the salt has been washed out by rains. Sub-drainage is, of course, essential if the salt is to be removed effectively, and supplementary treatment with gypsum, lime, or sulphur may be necessary to improve the physical conditions of the soil.

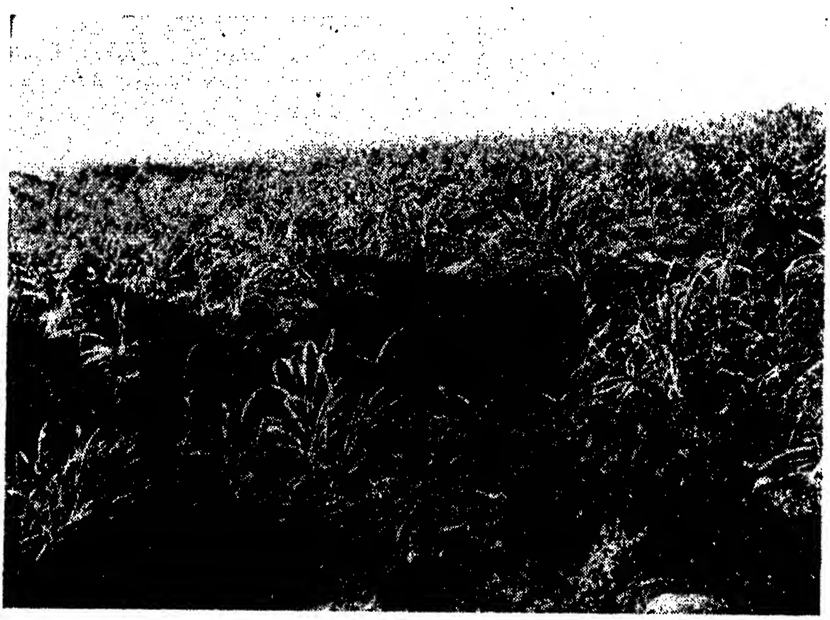


Plate 191.
The poor stand of young cane was due to the removal of surface soil from the hillside, by erosion.

Amongst "injurious factors" might be classed pests and diseases of sugar cane. The farmer should be continually on his guard against the presence of these factors; and although it is not expected that he will be able to recognise and identify all of these, or even diagnose the trouble when it occurs, he should at least be able to detect that the trouble is due to some such biological cause, and invoke the aid of the experiment station officer to assist him.

This is particularly important in the case of cane diseases; at the present time the Southern cane districts are seriously threatened by Fiji disease, and the chief difficulty with which the Bureau has to contend in eradicating this trouble is to find out where the disease

occurs, so that steps may be taken to prevent its spread. The wisest course for the farmer to follow in matters of this nature is, then, to report immediately to the nearest experiment station anything whatsoever of a suspicious nature. An early visit from an officer will then reassure him, or advise what must be done to correct the situation.

Other Causes of Depleted Yields.

It would be possible to list and discuss a number of causes of local soil troubles, but this cannot be attempted in detail. There are, however, two important factors which growers may completely over-look. The first is *Soil Erosion*, leading to loss of plantfoods and general fertility, and the second is *Faulty Subsoil Conditions* which result in extreme droughtiness of the land.

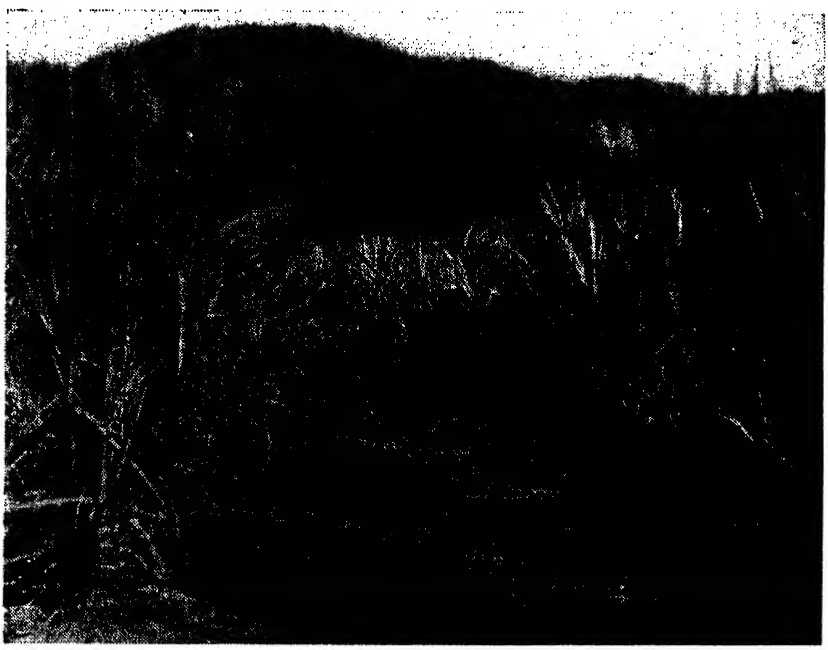


Plate 192.
Showing a badly "washed" area on which the cane cannot survive, due to the removal of the surface soil.

Soil erosion is, fortunately, not a matter of serious general occurrence in the cane districts of Queensland, but on certain hillside areas in regions of high rainfall, it has been responsible for substantial losses. In parts of the Innisfail district, farmers on red volcanic soils often find that the productive capacity of the soil falls off at a rapid rate for no very obvious cause. They will agree that "soil washing" occurs, but as the subsoil in such areas is generally very similar in colour and appearance to the surface soil, the loss of the richer surface layer is not detected, and the mischief is done before its true significance is realised.

Measures for overcoming soil erosion have been discussed in earlier issues of this Bulletin. At this time will be recorded only those measures which have been found most effective in dealing with the trouble.

Ordinary applications of artificial manures are of no avail in restoring fertility in such circumstances, and the only effective and economical method is to apply heavy dressings of mill by-products—mud, molasses, and ashes. This practice is now being followed with excellent results in the South Johnstone area. Green manuring, and trash conservation (as a surface mulch) in ratoons, are also two factors which will assist the farmer.

A case was recently reported where cane on an apparently fertile area suffered very severely during dry weather, for no obvious reason. An examination by the instructor in cane culture showed that at a depth of two feet the soil was underlain by a deposit of water-worn stones and gravel, indicating the earlier existence of a watercourse in this locality. The cause of crop distress was thus made evident; such a layer of coarse material possesses little powers of water retention, even after the heaviest rains, and the crop was obliged to subsist on just so much moisture as the surface soil was able to hold. Unfortunately, there are no practical means of correcting such a difficulty.

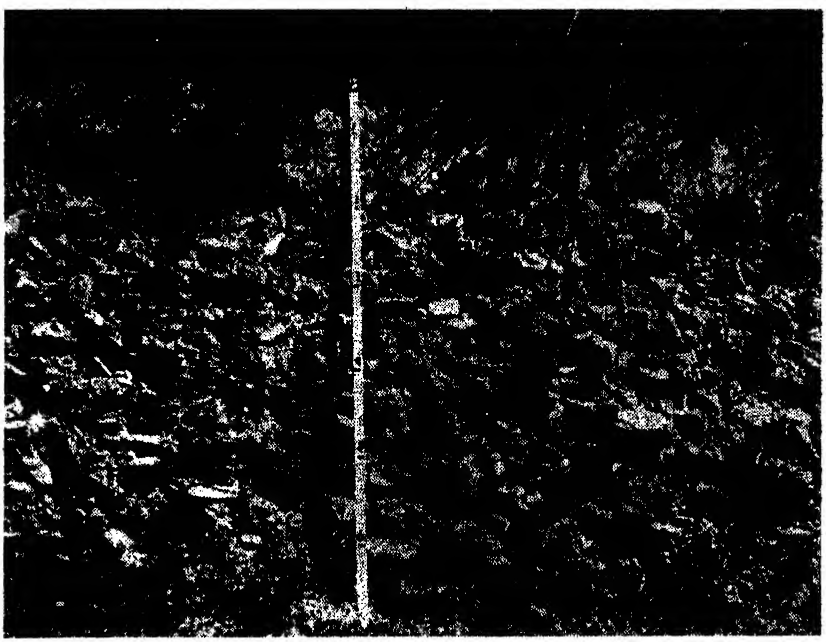


Plate 193.
Illustrating a bed of water-worn stone and gravel below 2 feet of soil.

Conclusion.

It is hoped that this discussion may stimulate cane farmers to make a more detailed study of the factors operating in their locality to make or reduce crop yields. The farmer should know his own conditions intimately, and it is generally unwise to blame any one cause for growth failure, until all possible causes have been investigated.

Introduction of Cane Varieties from Overseas.*

ARTHUR F. BELL.

IN common with most other crops there has been a great deal of interchange of varieties of sugar-cane between the different cane sugar producing countries of the world. At first, of course, this was entirely an unco-ordinated exchange of varieties as between growers in different countries. However, as time went by, it became apparent that this uncontrolled interchange of varieties also meant interchanging diseases, and of later years the responsibility for importing new varieties has been vested in the various Experiment Stations, which have facilities for guarding against the consequent importation of diseases. Those countries which went somewhat slowly in the matter of variety introduction in the early days, and which early adopted a system of strictly controlled introductions, now have their reward in a comparative freedom from serious diseases of sugar-cane.

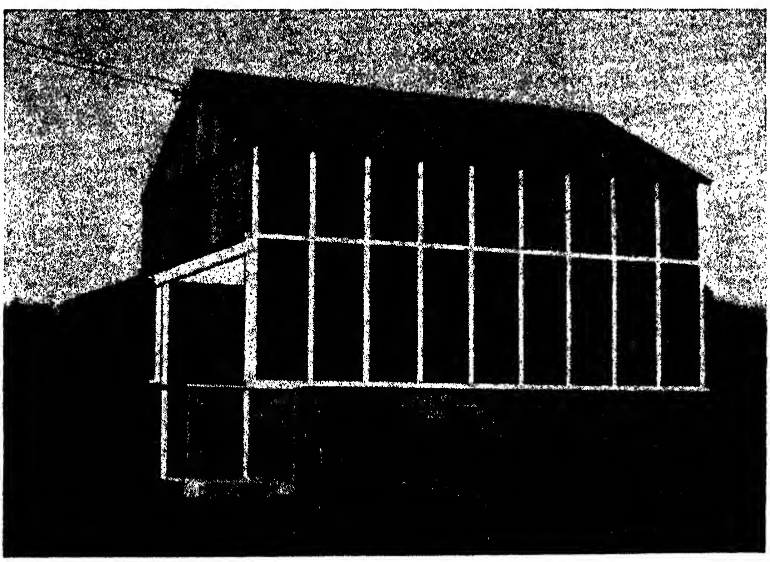


Plate 194.
Showing the quarantine glasshouse in which all newly-received canes are grown for a year.

Unfortunately, Queensland was very late in regulating variety importation with the result that we now have the world's richest collection of cane diseases. In this case, however, such control is much better late than never. There are still some diseases which do not exist in Queensland and also certain strains of some of the diseases we already have. Therefore it is very desirable that all reasonable precautions should continue to be taken when importing new varieties, and this can

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for October, 1938.

best be done under the aegis of the Bureau of Sugar Experiment Stations. The Bureau maintains an insect-proof quarantine house in Brisbane; all varieties received from abroad are fumigated on arrival and then grown in the quarantine house, under constant supervision, for a year. By the adoption of these precautions it is highly unlikely that any disease would be spread into cane-growing areas.

Incidentally, it might be advantageously pointed out that this quarantine house has well justified its existence. In 1936 Fiji disease was detected in two varieties which had been imported from New South Wales. If we had had no quarantine facilities and these cuttings had been sent to one of our field stations for propagation, then Fiji disease might have been introduced into Central or Northern Queensland. Naturally all varieties growing in the quarantine house at that time had to be condemned; the apparently healthy canes were planted again and grown under observation for a further year before being distributed. This occurrence also explains why some varieties—Q. 2 for example—have been a year late in reaching certain of the districts in Queensland.

For some reason, obscure to us, there exists in some quarters a belief that since the re-organisation of the Bureau, ten years ago, the importation of varieties from abroad has been greatly reduced and that the present administration does not favour such importations. We trust that this belief will be exploded by a comparison of the number of varieties imported direct by the Bureau during the ten years 1928-1938 with the previous ten-year period of 1918-1928 (June to June in each case) :—

Country of Origin.	Varieties Imported, 1918-1928.	Varieties Imported, 1928-1938.
Hawaii	6	68
Java	8	13
Mauritius	13	0
India	6	12
United States	0	9
West Indies	3	2
New Guinea	1	1
Philippine Islands	4	0
Totals	41	105

During the last ten-year period some dozens of seedlings raised by the Colonial Sugar Refining Company in New South Wales and Fiji, and varieties imported from abroad into New South Wales by that organisation, have been introduced into Queensland for trial purposes either by the Bureau or by the company itself. In addition, in 1928 an American Sugar Cane Expedition visited New Guinea and collected over one hundred varieties which were placed at the disposal of the Bureau. In actual fact therefore it will be seen that the last ten-year period has been a very active period in the matter of foreign variety introduction.

It is true that the existence of these varieties has not been brought so prominently before the public in later years as previously. In former years newly imported varieties were often distributed for farm trial as soon as sufficient stocks were available; they were not tested for disease resistance and were allowed to find their own level by trial and error test. Nowadays, however, we have both the staff and the facilities

Cleaning and grinding grain for "Red Comb" Poultry Foods

for carrying out disease resistance trials on an adequate scale, and new varieties must satisfy the disease resistance requirements of a district before they are placed in yield trials in that district. Most other sugar-cane producing countries have very few major diseases, and the varieties we obtain from them have naturally not been tried out against more than one or two of our diseases. Consequently, when we subject them to disease-resistance trials the majority are found wanting and are quietly discarded; naturally, then, the general public hears nothing of them.

In Hawaii, for example, the only major diseases common to our two countries, and for which resistance trials are carried out, are leaf-scald and chlorotic streak diseases. When we subject their varieties to test we find the vast majority of them susceptible to gumming, downy mildew, or Fiji disease, or all three of them, and very few have ever reached farm yield trials. This system is obviously a much better one than that of planting the varieties out to considerable areas and then finding that they are highly susceptible to one of the particular diseases present in that district.

Actually, the number of countries from which we can import varieties is very restricted since a number of the cane-producing countries carry out little or no cane breeding. The important sugar-cane country of Cuba, for example, has never greatly interested itself in cane breeding, while some countries, such as South Africa, are situated too far from the tropics to permit of cross pollination of cane varieties. Java, once a valuable souce of new canes, now prohibits the export of canes, therefore its newer seedlings are not available to us.

A discussion of the question of variety importation from overseas must necessarily include reference to the neighbouring island of New Guinea. Owing to the remarkable success of Badila in this country there is quite naturally a feeling on the part of farmers generally that we should continue to seek new varieties in that country. With that viewpoint we agree to a certain extent, but there are several factors to be considered. In the last fifty years several hundred varieties (probably many of them duplicated) have been brought from New Guinea to Australia, but with the exception of Badila and Korpi, there is not a single one of all these varieties which amounts to 1 per cent. of our crop (Korpi constitutes about 1·25 per cent.). Thus it would seem that the importation of Badila has been a very large slice of luck and, had that variety not been introduced, New Guinea varieties would have been regarded as very second rate.

New Guinea is one of the original homes of sugar-cane, and we also know it to be the original home of a number of the important sugar-cane diseases. In those places where the cane and certain diseases have existed together for centuries, we might expect that the cane must have acquired a certain amount of resistance in order to survive. It does not appear to us that New Guinea is likely to prove a promising hunting ground for new commercial varieties but it does attract us from the standpoint of a suitable place from which to obtain lines from which to breed. It is logical to assume, for example, that the place to look for canes for use in breeding for Fiji disease resistance is a section of New Guinea where Fiji disease is found. Unfortunately, it would be necessary to send an expedition to New Guinea to observe the diseases

and collect such canes, since the organisation of that country is not such as to obtain a satisfactory collection otherwise. Should such an expedition ever visit New Guinea it would also be of great interest for it to examine the type of cane which was found by the late J. G. Hides, and which was growing at an elevation of over 6,000 feet.

We trust that in the foregoing discussion sufficient has been said to dispel any false ideas that the importation of varieties from abroad has been curtailed, or that there is an intention of curtailing it. On the other hand, it is wise not to expect too much of imported varieties. Yields are increasing in most sugar-cane countries, due in part to the development of varieties which suit local conditions better than the varieties they displace. It therefore becomes more and more the case that an outstanding variety in any country is outstanding because it dovetails closely with the particular requirements of that country, and hence is not particularly likely to be a pronounced success in any other country. It is interesting to note that Badila, the outstanding cane of Queensland and Fiji, is scarcely grown elsewhere. H. 109, the "wonder" cane of Hawaii, is seldom worth a second look in other countries; P.O.J. 2878 has not found outstanding favour outside Java (although of great value in parts of Southern Queensland and New South Wales). B.H. 10/12 and S.C. 12/4, the leading canes of the West Indies, are a failure elsewhere, and so on. It seems to be very much a matter of hit and miss, and it would appear that the needs of a country are best served by developing its own cane-breeding services to the utmost. To this end the Bureau is now raising seedlings at its three field stations, and the resultant seedlings, after full test, are commencing to reach commercial scale plantings.

At the present time one of our officers, Mr. N. J. King, is visiting Hawaii and the United States, and he has been instructed to make enquiries regarding varieties suitable for importation into Queensland. It will be readily appreciated that the man on the spot has a much better basis for judging the possibilities of a variety than is obtainable from reading reports, and we look forward with interest to receiving his selections.

A New Species of Legume.

In the April issue of the "Quarterly Bulletin" brief reference was made to experiments with a new leguminous species, bearing the formidable name *Crotalaria goreensis*. Arrangements have been made for further trial areas to be planted at our Experiment Stations and on selected farms throughout the cane districts, and in all probability more will be heard of this legume.

It is therefore desirable that it be endowed with a name which will be more readily pronounced and remembered by farmers. As it was imported from Gambia, Africa, it is proposed to call it the "Gambia Pea," and it will therefore be referred to as such in all future publications of the Bureau.

—H. W. K., in The Cane Growers' Quarterly Bulletin.

Notes on Rat Baits, Rat Poisons, and Rat Population.*

W. A. McDOUGALL.

PROBLEMS connected with poison baits for rats can be conveniently placed in two groups; (1) those dealing with rats as *average* individuals, (2) those concerning rats as *a population.* It is proposed to deal chiefly with some aspects of group (1), viz., "median lethal doses" of the common rat poisons, bait bases, bait strength, and intake. Knowledge gained from a study of these portions of group (1) is one of the fundamentals for dealing with the second group, which actually covers possible control of rats in the field by poisoning. Unfortunately, the subject of rat populations, that is, the numbers of rats, kinds and ages of rats, condition and behaviour of rats in the field, is also of fundamental importance for a proper understanding of group (2). At the present time conclusions resulting from the early progress in our study of rat populations, and their application to the economic problem of rat control, must in some degree be a matter of opinion. They are given here as such.

Rat Bait Bases.

It is necessary that the few semi-technical terms used above should be explained at this stage. A "bait base" is a rat food into or on which a poison is placed. Bait strength denotes the proportion of poison to food in the bait. "Intake" means the amount of bait or food that an average rat may eat or can be expected to eat. We should distinguish between intake and take: intake is a true index of the palatability of a bait or food, whereas take, which could be called a field term, usually denotes the amount of material which is taken in the field. Obviously "take" depends upon a number of factors including bait or food palatability and the proportion of material offered to the number and weight of rats present. The "median lethal dose," or M.L.D. for short, is a term used for comparing the "deadliness" of different poisons. An M.L.D. of 250 means that a dose of 250 milligrammes of poison per kilogramme body weight of rat will kill 50 per cent. of the rats which eat it. It follows that a poison with an M.L.D. of 30 is ten times more deadly than one with an M.L.D of 300.

The field rat (*R. culmorum*) is predominantly a vegetarian, and foods which have been or may be used for bait bases could be listed in order of preference as follows:—rolled oats, a prepared food, cracked corn, corn, wheatmeal, whole wheat, barley, and bread. Rolled oats stands out above the others; barley is not a food particularly desired by the field rat, and there is always a poor intake of bread. For general purposes, the average field rat can be expected to eat approximately $\frac{1}{4}$ oz. per night of an unpoisoned food such as wheat, and in the winter time as much as $\frac{1}{3}$ of an oz. The climbing rats (*Melomys littoralis* and *M. cervinipes*) which are smaller species, eat less. The actual palatability of baits is not improved, so far as the economic aspect

* These notes are a summary of two papers ("Improved Baits and Poisons for Rats" and "Rat Populations") contributed at a Conference of Cane Pests Destruction Boards, held at Meringa, on 25th May, 1938, and reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for October, 1938.

of baiting is concerned, by the addition of linseed or corn oil. These oils are excellent attractants, but they are not appetisers. It seems as if the fundamental fact governing intake is the palatability of the base bait as a food. Such intake is, in different degrees, modified by the several rat poisons at different bait strengths. We do not know of a material (called an "appetiser") which, when added to a poor bait base or a bait of poor intake, such as phosphorus on bread, will increase the intake.

Rat Poisons.

Having briefly discussed bait bases, &c., we shall now turn to the poisons. It has been found that, for our conditions, most of them can be dismissed very briefly. Red squills is variable in quality; the M.L.D.'s of samples used by us varied from 350 to 1,000. Arsenic (the sample used by us gave an M.L.D. of 200) gives very variable results. Zinc phosphide has an M.L.D. between arsenic and thallous sulphate, and of all the reputed rat poisons used by us, barium carbonate is the most useless from the point of view of its deadliness (M.L.D. about 1,000 at bait strength of 1 in 5). From a practical standpoint, all the above poisons together with the strychnines (probably the alkaloid is the best) and yellow phosphorus, tend to reduce bait intakes. The strychnines and phosphorus, however, are very deadly poisons. The effect of the strychnines on different rats is variable, but in general this poison is much more deadly than thallium. Phosphorus is easily the most deadly rat poison with which we have dealt. The small M.L.D.'s or extreme deadliness of these two poisons make up to a considerable extent for the small intake of baits containing them: this is particularly true for phosphorus. The successful administration of all rat poisons other than phosphorus, depends upon the intake of comparatively considerable, but variable, amounts of desirable foods. Phosphorus, on the other hand, is usually used on a cheap bait base (bread) with a very poor intake. Actually any successes with phosphorus and bread are due to heavy overdoses, accepted by the rats in very small intakes. Thallous sulphate, with an M.L.D. of approximately 35, is a very reliable poison. It is considered that, in the light of our present knowledge, and taking into account the numerous factors concerned, a bait strength approximating closely to 1 in 300 would be the best for thallium sulphate treated wheat in our cane fields.

Last year we had for our use a fairly uniform field infested by rats. We were able to obtain considerable information about the rat population in this field without reducing it in any way. There was very little migration, only one species of rat was present, and the relative sizes of the rats were such that similar behaviour could be expected from them all. It was found that a 62·4 per cent. take of ¼ oz. packetted, paraffin-coated, linseed oil sprayed, 1 : 500 thallous sulphate treated wheat, at the rate of 200 baits per acre, laid at ten yard intervals, had the same effect on reducing the rat population as a take of freshly prepared bread-phosphorus baits so small that it could not be calculated. It is not intended that this experiment be used to compare these two baits as rat controls. These baits are extremes in so far as intakes are concerned, but it is evident that it is futile to compare, on field takes, the actual effectiveness of baits of different intakes. The reduction of the rat population to a degree sufficient to prohibit damage to cane is the chief criterion for the success of poisoning. A certain bait may give valuable results in the field. When it is known that the particular bait can do good work, its failures are not necessarily due to a shortcoming

of the bait itself, which can be rectified. Very probably other good baits would fail also in the particular circumstances. This leads us to a consideration of rat populations.

Rat Populations.

Very often the popular conception of the subject of rat populations is limited to the question of how many rats per acre do we have to deal with to stop damage in our cane fields. No doubt the answer to this question is important, but we should be interested also in the kinds or states of population. For example: the destruction of a rat population consisting of non-migrating, reasonably even-sized rats at the rate of 100 per acre is much easier than attacking successfully a similar-sized population made up of small and large rats. Again, the damage to cane by a rat population of, say, 100 per acre is more easily prevented by poisoning in a field where this population has been born and bred, than in a field to which it has migrated.

In years when damage to cane by rats is most severe and wide spread in Queensland large rat populations are present. These are often called "plague" years, and during these years the rat population exhibits, besides "quantity," most of the difficulties associated with "quality" which could be encountered in rat control. At the present time, when there are not sufficient data available to help in forecasting rat plagues in cane fields, no recommendation can be made as to the best and most economic method of preventing or combating rat plagues.

In normal years nature takes a severe toll of rat populations between October and January. During this period large numbers of the heavier and older rats die off. With this in mind, and taking into account several other factors, including the small amount of rat damage in normal years and the remarkable recuperative powers of rat populations, it is considered that continuous and general all-the-year-round poisoning of cane fields and adjacent rat environments may not be economically sound. At least during normal years, attacks on the rats themselves or other direct methods of control, if necessary, might best be applied to localities where it is obvious that damage is occurring.

Farmers' Breeding Flocks.

The want of the right type of ewe in the breeding flock is often the fat lamb raisers' difficulty. As a straight-out breed, the Corriedales should meet the requirements to the greatest extent. The sheep selected for the purpose should be of the true Corriedale type, possessing large, deep, well-formed frames, and producing a long fleece of 56s 58s spinning quality. Should these not be available, then an English long wool crossed on the large-framed, plain-bodied merino will be found satisfactory. The trouble with this type, however, is that if conditions are suitable for fattening lambs when they are on the ewe, the temptation to sell them as lambs is too great. Well-grown crossbreds at five months can be sold usually to such advantage that it pays the man on good—and, therefore, expensive—country to sell them as lambs and buy ewes at the breeding age. Practically the only ewe at breeding age that is available in Queensland is the merino.

The only way out of the difficulty is for sheep farmers on suitable country further west to breed either pure-bred Corriedales or English long wool crosses, and sell the ewe progeny when about 2-tooth to the fat lamb raisers. The advantage of breeding to the pure-bred Corriedale is that only one breed is necessary; and, as they are suitable as a farmer's flock for both wool and mutton, they serve the dual purpose with the breeder, and the surplus ewes should meet with a good demand from fat lamb raisers. Much of the brigalow lands in the medium rainfall areas, when sufficiently developed and improved, can be used to advantage for sheep breeding, and the Corriedale is, it is considered, more suited to these areas than the merino.

—*J. Carew.*

THE CORRIEDALE.

The qualities of the Corriedale as a general utility sheep are not sufficiently appreciated in Queensland. The Corriedale was founded on the Lincoln-Merino cross, from which was evolved this distinct breed which possesses the most valuable characteristics of the best type of dual purpose crossbred. That is to say that when the Corriedale ewe is joined with a Downs ram the breed produces a fleece of high quality as well as a lamb of outstanding merit.

In Queensland, a tendency to produce a sheep too fine in the fleece has been observed in some Corriedale studs. It should be recognised, however, that this tendency if allowed to persist will eventually defeat the object for which the Corriedale was evolved.

—*J. L. Hodge.*

THE CULLING OF FLOCKS.

Faulty fleeces, malformation, lack of conformation, constitution, and size, and a general unthrifty appearance are all indications of the necessity of culling the flock.

The covering of wool should be governed, to a great extent, by the conditions of the locality in which sheep are to be depastured. In Western and Central districts of the State, where climatic conditions have a fining influence on the fleece, a fibre on the strong side of medium is advocated. Colour, length of staple, character—all combine to make a quality fleece.

With the culling of the ewe flock should go the selection of better rams. With rams, the type selected should be at least somewhat stronger in the desirable characteristics than that of the ewes. Prepotent power—that is of like begetting like—is of great importance, and is generally indicated in the ram's head. Having achieved a type, the quickest way to fix and retain it is to continue with the same strain of rams. It takes the breeder of long experience to chop and change successfully from stud to stud when introducing new blood.

—*J. L. Hodge.*

UNIFORMITY IN FAT LAMBS.

One of the greatest hampering factors in the fat-lamb raising industry is the lack of the right type of crossbred ewe. In fat-lamb raising in Queensland, a beginning has often to be made with the Merino ewe. The type chosen should be of the large-framed, strong-woolled kind. On ewes of this type, long-woolled rams—such as the Romney Marsh, Border Leicester, or Lincoln—should be used. The ewe progeny of this mating should be reserved as future breeders in the fat-lamb producing flock. To produce the most desirable lamb at an early age, the use of Southdown, Dorset Horn, or Shropshire rams on these crosses is advised.

Pure Corriedale ewes make excellent mothers for the early fat lamb.

Time is saved and impetus is given to the fat-lamb industry when farmers acquire ewe weaners of the right crosses. It is always a pity to see these potentially valuable breeders slaughtered.

—*J. L. Hodge.*

BUYING FLOCK RAMS.

Even in these more or less enlightened days too many graziers still hold the opinion that practically any flock rams will do, so long as they are pure merino and cheap enough. No greater mistake could be made in the breeding of sheep. The ill-effects of such a policy are lasting.

In the selection of rams for a certain line of ewes, familiarity with the type and qualities of the latter are essential.

A grower without the necessary knowledge to successfully "nick" the sexes would be well advised to employ a man fully qualified for this important work.

Violent contrasts in the types of ewes and rams should be avoided. For instance, if a grazier has a medium flock of say 64's quality, and it is desired to strengthen the clip somewhat, it is not advisable to join the strongest of merino rams. This is an attempt to do in one year something which should take not less than four years. Breeding for an alteration of type should be gradual.

Rams selected for a certain line of ewes should be slightly stronger in fibre than the ewes with which they are to be joined, and, further, should be specially selected to rectify any pronounced fault in the ewe flock.

A guinea or two is neither here nor there in the acquisition of suitable flock rams.

—*J. L. Hodge.*

IMPROVEMENTS ON THE GRAZING SELECTION.

Improvements on newly acquired sheep lands are important from two points of view—firstly, their place in economic management, and, secondly, the necessity of avoiding the making of improvements likely to over-capitalise the property. A horse paddock is a prime necessity, and should be sufficiently large to run working horses and house milking cows.

If the lie of the land allows it, the horse paddock should be situated as near as possible to the centre of the property. The advantage of this will be found when the selection is stocked. The shorter distances to ride will be appreciated by both man and beast. The fencing should be sheep-proof, and the paddock cleared of unnecessary timber. Fencing the boundary is the next important job. The nature of this fence depends on the conditions under which the land has been selected. It may be that rabbit netting has been specified, and a dog-proof fence may be necessary. In any case, the boundary fence should be the best of its kind. If an addition to the natural water supply is necessary, this should be attended to at once. In this connection, the selector would be well advised to observe the methods adopted in the district. Bores, wells, and surface tanks all have their advantages, according to local circumstances. If the country is naturally watered, the subdivision fences should be so planned, as far as practicable, that permanent water will be in every paddock. Substantial yards—preferably of post and rail construction—are necessary at the homestead. The yards may be used for both horses and cows. A sheltered calf pen

should be attached. If conditions make it necessary, judicious ring-barking is the next job. Consideration should, however, be given to the reservation of tree belts for shade and shelter.

A woolshed and drafting yards on a small property should be close together and conveniently situated. The homestead, and its lay-out, is important, but its cost should be in keeping with the capital value of the holding.

—*J. L. Hodge.*

THE BEST TYPE OF LAMB FOR EXPORT.

To meet the demands of both the home and the export trade, a true sucker lamb must be prime fat, irrespective of weight.

To produce the right lamb for export, at an age profitable to the grower, breeding is a prime essential. It follows naturally that different graziers have preferences for certain breeds of English sheep, but it may be laid down broadly that the best lamb for export is produced by a Downs sire—such as the Southdown or Dorset Horn—from a ewe of one of the long-woolled breeds—such as the Romney Marsh, Border Leicester, or Lincoln crosses. The foundation merino ewe should be of a large-framed strong-woolled type. Corriedales make excellent breeders. Ewes in lamb should be maintained in good, strong condition, and no feed is too good for them after dropping.

From 30 to 33 lb. is the proper weight of a fat lamb, and this weight should be attained when it is about four months old.

—*J. L. Hodge.*

SHEEP-DIPPING.

The only known method to combat lice and ticks (ked) in sheep successfully is to dip. A preparation of proved efficiency should be used. If a powder dip is chosen, great care should be taken in the mixing. The powder in small proportions should be mixed with water and stirred until the consistency of an ordinary mustard mixture is attained. When the whole of the powder necessary to charge the bath is so mixed it may be added to the full quantity of water in the dip. This should be done overnight.

It is necessary to follow carefully the directions as to quantities given by the manufacturers. Sheep get most benefit from dipping when a month to six weeks off shears. Never dip sheep when they are hot or thirsty. For the job, avoid, if possible, extremes of heat and cold. Let the sheep drain thoroughly in the shade, if practicable. Treat the dipped sheep gently and avoid driving them for any considerable distance.

SUNDAY MORNING—THE COUNTRYMAN'S SESSION.

Radio Service to Farmers.

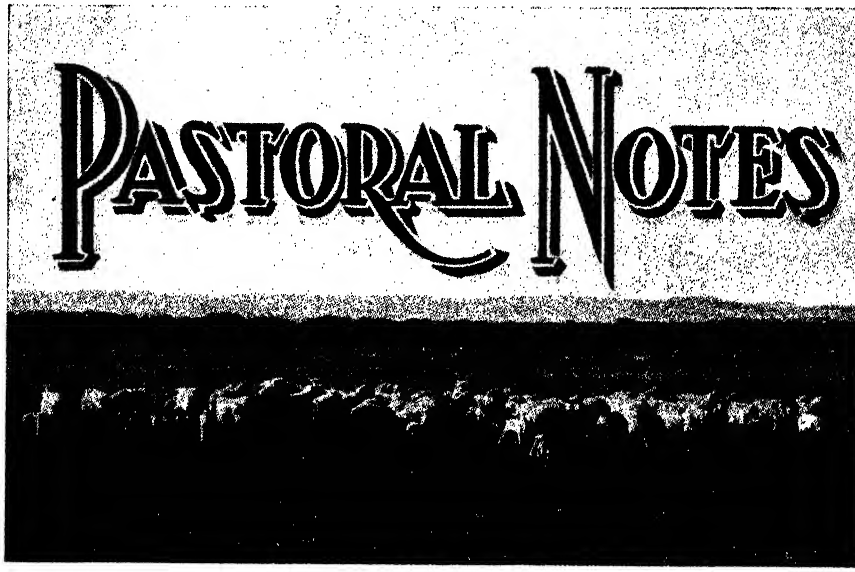
Every Sunday morning at half-past nine a bright, topical, and entertaining programme of information on rural subjects is broadcast from National and Regional Radio Stations. (By arrangement with the Australian Broadcasting Commission.)

Farmers are recommended to tune in to—

4QR (Brisbane), 4RK (Rockhampton), or 4QN (Townsville).

EVERY SUNDAY at 9.30 a.m.

Weather and market reports and a wide variety of farm topics.



Irregularities in the Teeth of Horses.

The horse has two dentitions—a milk dentition, and a permanent dentition. The incisors and premolars are milk teeth, and are replaced in due course by permanent teeth.

The centre permanent incisors appear from two and a-half to three years old, the lateral from three and a-half to four years old, and the corner ones from four and a-half to five years old when the animal is said to have a full mouth. The tushes seldom appear before the age of four years, are well up at four and a-half years, and are level with the corner incisors at five years. In mares, these canines seldom appear.

Occasionally the milk teeth are not shed before the appearance of the permanent ones, and they may interfere with their normal growth, pushing them out of position. Removal of these milk teeth sometimes is necessary, and this is done with small forceps, or even by levering them sideways with a strong knife blade. Never break them off. After their removal the permanent tooth soon straightens up.

Many horses, particularly aged horses, lose condition because of pinnacles and sharp edges on the molars, and which may prevent the proper mastication of food. These irregular projections are found on the outside of the upper and the inside of the lower molars, sometimes cutting into the cheeks and tongue, causing painful sores; or, one molar may be found to have grown too long through decay of the opposite one, and consequent lack of wear, that it prevents the other molars from meeting, and the horse is unable to grind its food.

An affected animal shows distress in chewing by holding its head on one side to chew, and eventually dropping the half-masticated bolus from its mouth.

Other evidences of distress are an objection to the bit being put into its mouth by tossing the head, or by "running away from the bit" when pressure is applied to the reins.

Indigestion and colic are usually the consequence of this condition.

The remedy lies in the careful and patient use of the tooth rasp, which is used in conjunction with a mouth gag, care being taken not to destroy the natural bevel of the teeth, for it must beremembered that mastication is performed by movement of the bottom jaw, the bevel of the teeth providing the resistance, so that food may be properly ground. After the teeth have been levelled, the mouth should be swabbed out with a solution of borax and water, and a suitable tonic given with feed—such as gentian root powdered, four parts; sulphate of iron powdered, two parts; nux vomica powdered, one part. Two heaped tablespoons of the mixture should be given twice daily in a small quantity of dry feed.

TETANUS IN HORSES.

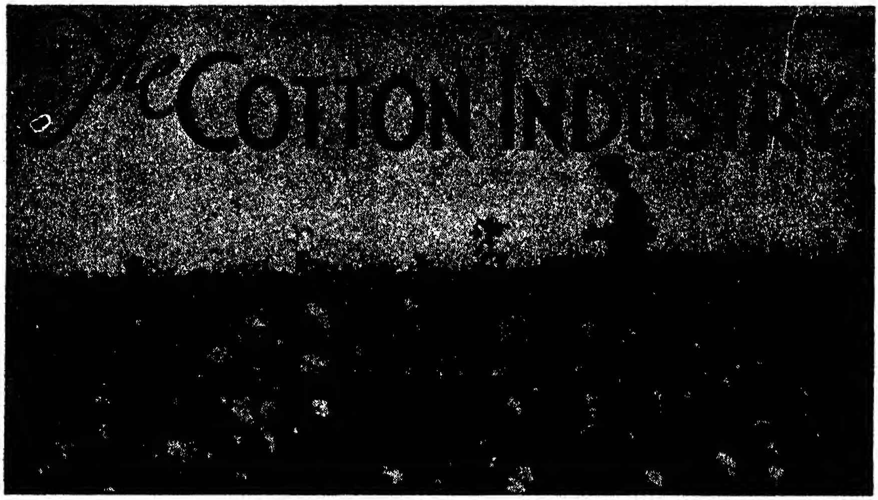
From time to time valuable horses die from tetanus (lockjaw), and, in some instances, early attention might mean the saving of the animals. The financial loss to the owner is serious, especially when the loss is not covered by insurance. The loss in the case of the death of a valuable draught or thoroughbred stallion is a matter of community as well as of individual concern.

Once tetanus develops and symptoms become evident, it is almost impossible to save an animal. The symptoms are dilated nostrils, head poked forward and neck stiff, movements slow and hesitant, tail elevated and held straight out, and the third eyelid (haw) swinging backwards and forwards across the eye at the slightest noise. Clapping of the hands or opening of the stable door may produce the last mentioned symptom. In short, the animal appears stiff all over, is unable to bend the body normally, and is described as "swinging about in one piece like a ship at sea."

In horses, tetanus usually occurs as a result of some small injury, such as a punctured wound in the foot or any other part of the body. Stable manure is a most suitable medium for tetanus germs.

The incubation period in most cases, especially in horses, is one to two weeks. However, cases have occurred where symptoms have been observed twenty-four hours after infection. Preventive measures should always be adopted by thoroughly cleansing the wound and treating it with tincture of iodine or some other antiseptic. In cases of punctured sole or bruises, after cleansing the wound thoroughly and treating it with antiseptic dressings, plug the wound with tow soaked in tincture of iodine and bandage the foot to prevent the entrance of dirt. In all cases tetanus anti-toxic serum should be injected. It is not claimed that the inoculation protects the animal for any length of time, but the use of anti-toxic serum immunises the animal over the period in which infection might be gathered through an open wound.

—*Dr. F. H. S. Roberts.*



Cutworms in Seedling Cotton.

During the spring and early summer months, one of the most serious pests of seedling cotton with which the farmer has to contend is the common cutworm.

Cutworm outbreaks may necessitate replanting, which is successful only when the soil contains adequate moisture. In any case, some time may elapse before resowing is practicable, and the replant crops are rarely so successful as those sown early. For that reason, precautions should be taken against cutworms to ensure a commercial stand of cotton with the first seeding.

The winter of 1938 has been more or less favourable for the insect, and good spring rains may be followed by a widespread emergence of moths. Farmers therefore should be familiar with the habits of the pest and the methods used for its control.

Cutworms, the larvæ of a dark-brown moth, are stout, soft-bodied, greyish-brown to greyish-green caterpillars, growing up to 1½ in. in length. They feed principally on low-growing weeds, but if these food supplies are disturbed in any way the caterpillars may migrate to nearby cotton fields or, if already in the cultivation, may damage the germinated cotton. The pest feeds at night and normally attacks the stem just above the ground level.

Cutworm losses in cotton may be considerably reduced by good cultural methods. Thorough ploughing, in which weeds are destroyed completely, is necessary. Patches of weeds missed during ploughing are frequently the centres from which extensive cutworm damage radiates. Ploughed land should be kept free of weeds for at least a month before planting, which, if the rains are suitable, will be carried out between mid-September and mid-October. Early ploughing is therefore required. After planting, weeds should be kept in check.

If weeds are ploughed under immediately prior to planting, the risk of cutworm injury is increased greatly, for many of the eggs and larvæ on the weeds will survive and attack the cotton seedlings.

Virgin land, or Rhodes grass paddocks which are being prepared for cotton, usually contain little weed growth, and this, to a great extent, minimises the risk of cutworm injury. Nevertheless, early ploughing is still preferable, in order to ensure the preparation of a good seed-bed, and to allow adequate time for the organic matter to break down.

Where direct control of the cutworms is required, insecticides must be used. The poisoned bran bait method has been tested thoroughly, and is recommended as a reliable control measure.

To prevent the entry of invading swarms, the bait should be distributed along one or two ploughed furrows across and in front of the line of attack. When the pest is within the field, the bait may be broadcast or applied in lines along the rows of cotton seedlings. If broadcast, about 50 lb. dry weight of bran will be required per acre; if distributed along the rows, 25 to 30 lb. dry weight of bran per acre should be sufficient for baiting purposes. The formula of the poison bran bait is as follows:—25 lb. bran, 1 lb. Paris green, 2 quarts of molasses, and enough water (2 to 2½ gallons) to make a friable, crumbly mash which can be broadcast without difficulty. The bran and Paris green are first mixed dry; the molasses is dissolved in the water, and after being mixed the whole is well stirred up to make the mash as required. As the cutworms are night feeders, the bait should be applied in the late afternoon and evening. The use of insecticides for cutworms is a remedial measure only, and is not normally necessary if efficient cultural practices are applied on the farm.

—*W. J. S. Sloan.*

TRIALS WITH MAIZE TRAPS IN COTTON.

Maize in the tasselling and earing stage is much more attractive to corn ear worm moths for egg-laying purposes than cotton, and by utilizing this attraction attacks may be concentrated on maize, and the cotton crop protected from severe injury.

During the 1936-37 season, successional plantings of maize rows were made at regularly-spaced intervals through a selected cotton field. The maize was periodically treated with a poison swabbing mixture, consisting of 1 lb. of lead arsenate, 1 gallon of molasses, and 1 gallon of water, to destroy the larvæ. Results from this trial were promising enough to warrant an extension of the area on which the maize trap crop method of controlling the corn ear worm in cotton was used. In the following season, sufficient space was left in 370 acres of cotton, distributed over six farms, to permit the interplanting of strips of six rows of maize at regular intervals through each field. Each of these spaces was sown two rows at a time, the first two rows being sown three weeks after the cotton was planted and an additional two rows at three-weekly intervals thereafter.

Observations during the peak of the corn ear worm attack in late January and early February showed that a certain amount of egg-laying had taken place on the cotton, and that complete protection of

the cotton crop was not provided by the maize plantings. Nevertheless, the tasselling and earing maize traps at this period were very heavily infested with corn ear worm eggs which, in the absence of maize, would almost certainly have been laid in the cotton.

Unfortunately, severe losses of squares and bolls due to dry hot weather in February and March completely overshadowed any losses from corn ear worm attacks. Since all selected farms returned poor yields, because of drought reasons alone, the evaluation of the maize trap crop as a means of protecting the cotton crop was not possible.

However, four conclusions from the season's work require stressing:—

(1) When planting rains are delayed beyond mid-October, the first maize planting should be made at the same time as that of the cotton, instead of three weeks later, as required for September and early October plantings. When planting rains are delayed beyond November, only two maize plantings are required, the first of which coincides with that of the cotton. Only one planting of maize is considered necessary in cotton crops soon after December, and both the maize and the cotton should be planted at the same time.

(2) Maize plantings should be made as scheduled, regardless of the amount of soil moisture available. Dry planting may be a failure, but it is worth doing in the hope of obtaining an early strike of maize. Even if replanting is necessary, loss of time and seed in making the first planting is a comparatively small item.

(3) Land intended for the maize should be maintained free of weeds, and in a good state of cultivation prior to planting and during the growth of the maize. Proper cultural treatment is just as essential for the success of the maize as for the cotton.

(4) A swabbing mixture of a 1-1-3 formula (1 lb. lead arsenate, 1 gallon molasses, 3 gallons water) is suggested for use instead of the 1-1-1 mixture. The former runs more easily into maize silks and plant terminals, is cheaper and has given satisfactory results.

The maize trap crop method of controlling corn ear worm in cotton is inexpensive and easy to manipulate. Properly carried out, it decreases corn ear worm attacks in the cotton, and is therefore well worthy of trial. The maize must on no account be cut and fed to stock—the swabbing residues are poisonous. The shelled grain is, however, quite safe for feeding purposes. Farmers who contemplate using maize trap crops in the coming season are advised to make contact with the Entomologist at either the Cotton Research Station, Biloela, or the Department of Agriculture and Stock, Rockhampton.

—*W. J. S. Sloan.*

Treatment of Milk Fever.

J. C. J. MAUNDER, B.V.Sc.

SINCE the discovery of udder inflation for the treatment of milk fever, this disease has had few worries for the dairy farmer, but it is considered that a few notes on it, describing the precautions to be observed in udder inflation, some of the undesirable consequences that may follow, and recent advances in treatment, may be useful.

Usually the condition has been present some time before treatment is applied, and the affected beast will be down and more or less unconscious.

The udder should be wiped clean with a clean damp rag, and then a clean towel should be placed under the udder to prevent contamination from the soil. The beast should then be propped up on its breast bone in as natural a position as possible, taking care that the hind legs are in a normal position and not causing undue pressure on the udder. In very advanced cases, this may not always be possible, but it should be attempted.

Strip the udder of any milk present and then commence inflation with a teat syphon. Each quarter is inflated firmly and the teats are tied off at the bottom with clean tapes to prevent the escape of air. The udder should then be massaged gently to distribute the air throughout the organ. The tapes should be untied about half an hour after they were put on. If no improvement is noted after three hours, inflation should be repeated. The most undesirable after-effect that may follow treatment by udder inflation is mammitis. To avoid this the following precautions should be observed:—

(1) The teat syphon used should be sterilized thoroughly before use by boiling.

(2) Take every precaution during inflation that the teat syphon does not come in contact with any contamination; should that happen, immerse the syphon in boiling water before continuing its use.

These precautions are against the possibility of introducing any infection into the healthy udder.

(3) If a quarter of the udder of a cow being treated with milk fever is affected with mammitis, or has been so affected at any time, that quarter should be the last inflated; and, following use on that quarter, the teat syphon must be sterilized thoroughly by boiling before being used again.

The necessity for such a precaution is obvious.

Despite the fact that most cows treated for milk fever by udder inflation record an uneventful recovery, it has been found that better results are obtained by the subcutaneous (under the skin) injections of a substance known as calcium boro gluconate. It is well known that in milk fever the calcium content of the bood drops considerably, and the injection of calcium boro gluconate aims at restoring the lost calcium balance. In addition to being a more convenient treatment, other advantages it possesses over udder inflation are that there is no risk of introducing or spreading mammitis, recovery is more rapid, relapses are less likely to occur; and also the method may be used as a preventive. The drug is put up in convenient form commercially, and the local chemist will be able to advise where to get it.

The drug is usually issued in cartons containing 2½ oz., the contents are dissolved in 10 oz. of hot water recently boiled and then allowed to cool to body temperature before use.

The dose given is sufficient for one treatment, and should be injected under the skin at various parts of the body—do not inject all the solution in one place. The usual precautions are taken regarding sterilization of the syringe and needles and antiseptic precautions at injection.

It has been found that repetition of the dose is rarely necessary.

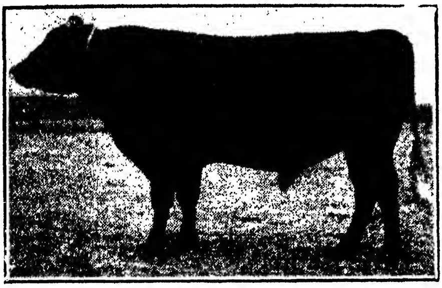
Some cows are known to be more subject to milk fever than others, and in such cases it has been found advisable to give an injection immediately after calving, followed by a second injection about twenty hours later. For these injections, the dose should be half that used for curative treatment.

Whatever the method of treatment adopted, it is advisable to cover the animal with a rug and in no circumstances should the beast be drenched as, because of the paralysis extending to the throat, the cow is unable to swallow, and any liquid forcibly given may enter the lungs and set up pneumonia which almost invariably proves fatal.

When the treated cow gets to her feet, it is advisable that some definite form of after treatment should be adopted. The udder should not be touched for at least twelve hours after the cow has risen, and milking "dry" must be avoided. Small quantities of milk should be drawn off at frequent intervals on the following day, and the diet should be restricted.

FAT LOSSES IN SEPARATED MILK.

When milk is passed through a separator there is always a certain proportion of the fat left with the separated milk. The extent of this loss depends on the condition of the milk and the efficiency of the separator. Cold milk is more difficult to separate than warm milk, because the latter is more fluid and the fat globules reach the centre of the bowl quicker.



"ALFA VALE PETER"

GOLDEN FERN IDYL (Imp.)
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The separator is a delicately balanced machine which is likely to lose its efficiency without any significant outward indication. Roughening or denting of the discs, vibration of the machine because of insecure foundations and an over supply of milk to the bowl as a result of a damaged float are among the causes of increased fat losses.

The matters with which the farmer is mainly concerned are the percentage of fat in separated milk, and the proportion of the total fat thus lost.

Some farmers may be amazed to learn that separated milk from an efficient separator seldom contains less than 0·06 per cent. of fat. Results of separator trials carried out by a well-known separator manufacturing firm show fat percentages ranging from 0·06 to 0·07, and accurate analyses in other countries indicate that, under normal working conditions, a percentage of 0·12 is quite common. Numerous analyses have shown an average of 0·08 per cent. of fat. The reasons for this loss is that all milks contain a certain proportion of very minute fat globules and only a comparatively small proportion of these are separated with the cream, the major portion being lost in the separated milk. This loss is unavoidable and cannot be appreciably reduced by adjustments to the separator.

Reports of analyses showing percentages of 0·01 to 0·03 should be discounted as worthless, as in all probability such tests were obtained by using the ordinary Babcock test. When applied to such products as separated milk and buttermilk the Babcock test is unreliable. Regulations under the Dairy Product Acts require that separated milk shall be tested by the normal butyl alcohol modification of the Babcock test. This method gives results comparing favourably with standard analytical methods.

An efficient separator removes about 98 per cent. of the total fat in the milk as cream, the remaining 2 per cent. of the fat being lost in the separated milk. A loss of 1·5 per cent. of the total fat is about the lowest that can be expected under normal working conditions.

—*L. A. Burgess.*

HYGIENIC MILKING METHODS.

To avoid contamination of milk, the milking yard and surroundings should be kept free from any accumulation of dust and dung by their removal after each milking. For the same reason, it is imperative to wash over the udders, teats and flanks of each cow before commencing to milk. Each bail should be provided with a separate bucket and clean cloth for this purpose, and the water should be changed as frequently as necessary. A basin or small bucket of clean water in which the milker should rinse his hands before milking each cow should be provided in every bail. A towel also should be provided for drying the hands, and this should be washed out daily in order to keep it perfectly sweet and clean. There is not yet sufficient appreciation of the actual monetary loss caused by neglect or carelessness in these all-important preliminaries. The extra comfort derived from milking a clean udder with clean hands should in itself compel their observance. A further essential is the donning of clean overalls before commencing to milk.

The straining of milk is another very important point in dairy practice, but a dirty strainer (cloth or gauze) is worse than none. It is sometimes noticeable after a bucket of milk has been emptied into a can that certain foreign substances have been intercepted by the strainer. These are left there, and the next bucket of milk is poured over them. When this has been done a few times the substance dissolves, and washes into the milk. It is obviously of very little advantage to use a strainer in such a way. As provided by the Queensland Dairy Regulations, cotton wads are specified for use in straining milk. As the wads are very cheap and readily obtainable, there is no reason why the wad should not be changed when necessary during milking.

SIMPLE SHEEP FENCE.

At the present prices of wire, anything that will economise in material is acceptable to landowners. The fence illustrated, which was noticed by a frequent contributor in Western Australia, will be found an effective fence for merinos and easily repaired. Only one wire is used, the posts being 100 feet apart, and the secret of success is to keep this wire tightly strained, with wire droppers from it to the netting selvedge. The netting is let into the ground, but is not fastened in any way to the posts. Fig. 1 shows the general arrangement of the fence. Fig. 2 shows the device for making the wire droppers, consisting of a piece of batten with a screw, A, a spike, B, and a

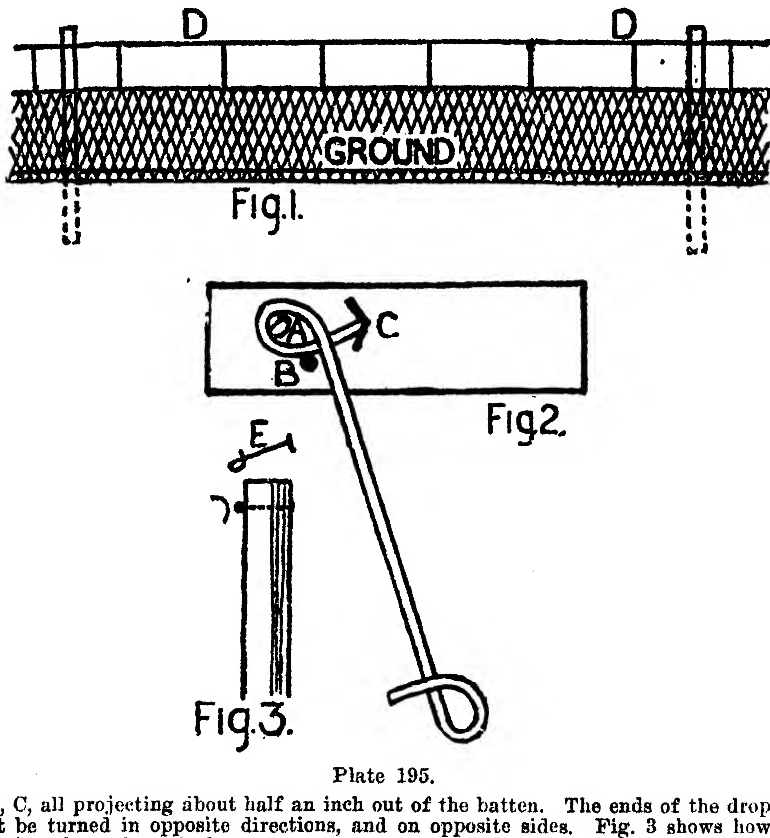

Plate 195.

stop, C, all projecting about half an inch out of the batten. The ends of the droppers must be turned in opposite directions, and on opposite sides. Fig. 3 shows how the top wire of the fence is fastened to the posts by a piece of wire, E, running through the post at right angles, with a twist about the size of a halfpenny at the back to hold it, and an ordinary hitch round the top fence wire to hold that wire in position at D.—*Australasian*.

Some Points in Pig-feeding.

E. J. SHELTON, Senior Instructor in Pig Raising.

THE following points on the feeding of bacon pigs have a particular interest for farmers in the districts southwards from Rockhampton:—

Soft, Oily Pork.—Although several foods may be responsible for this soft condition, all the evidence points to the fact that the chief cause of the trouble is the feeding of peanuts or meal manufactured from peanuts to pigs which are being finished or topped up for the market. When maize and other grain foods are relatively scarce and high-priced, and farmers are naturally tempted to use peanuts and peanut meal in place of grain, especially as peanuts produce particularly fast growth in young pigs, the position could be relieved if pig raisers would concentrate their peanut-feeding on the breeding stock and pigs to weaning age, which will make very good use of surplus peanuts, and then other foods available could be kept for the pigs from the weaner stage until they reach bacon weights. Separated milk, root crops, pumpkins, lucerne (either as green fodder, hay, or chaff), and small quantities of pollard, meat meal, and pasture can be used to make up good rations in the absence of maize.

Yellowish-coloured Pork.—It is known that the cause of this condition is an excess of carotin, a colouring matter in plant life, and which is present especially during the early life of the plant and at the stage when (as in the case of pumpkins) the crop is fully ripe or over-ripe. The feeding of an excess of green wheat, oats, or barley, in the absence of, or short supply of milk may also be responsible; so also may the continuous use of grass or of lucerne as the principal food.

Low-conditioned Pigs.—Lack of condition is, of course, invariably due to lack of sufficient nutritious food. When pigs are in such a condition they become more liable to infestation by internal and external parasites, which irritate the animal and cause much restlessness, especially at night.

It is better to keep fewer animals and to feed them properly than to attempt the keeping of more than the number for which food is available. It is better, too, to market the pigs when light and prime than to carry them on to heavier weights with loss of condition. Where milk is in short supply, meat meal may be used as a substitute. In all cases, the pigs should have clean drinking water and mineral matter, also charcoal.

Bruised and Damaged Pigs.—Where pigs are weakened as a result of lack of condition and where they are soft in texture—the result of improper food—they bruise much more readily, and tend to be more discontented. The only way to avoid bruising is to have the animals in the primest condition (not overfat) and to treat them kindly and not force or beat them when loading or unloading. Avoid kicking them or forcing them through narrow gateways or over rough stony yards.

Overfat Pigs.—Despite high-priced foods, there is still an appreciable proportion of overfat and very heavy weight stock coming forward. Pigs should not be fed too heavily on grain, but should be kept growing and given abundant exercise in grassy pastures. It is a mistake to keep pigs penned up continuously in small sties and bare yards. The use of flesh-forming foods like milk, meat meal, lucerne, greenstuffs, &c., and mineral matters will tend to overcome any tendency to over-fatness.

Use of Skimmed Milk and Other Liquids.—There is a widespread belief among dairy farmers that because at certain seasons of the year skimmed milk is plentiful, that milk costs them nothing. It is only during periods of short supply and during the colder months of the year that they really appreciate the fact that skimmed milk has a definite commercial value and actually does cost them something to produce, even though it may be difficult to show the amount in figures.

Milk may be regarded as the principal basic pig food, and is of such value that it should be used economically and with a full knowledge of its chemical content. It would not be right, however, to expect good results from rancid or impure milk, or from milk heavily diluted with water or other liquids.

It is uneconomical to attempt to force a pig to consume more than a normal allowance of milk or other fluid food. To do so causes gluttony without giving in return a proportionate growth value. The pig normally has a very hearty appetite and will eat almost any class of food. This appetite should be considered in feeding practice, especially as the digestion and assimilation of food proceeds at a rapid rate in a well-fed, healthy pig.

Foods vary in chemical content; they are intended for different purposes. With the unborn pig, all its food is naturally in fluid form. This form of nourishment continues until birth, and after, until the sucker reaches the weaning stage. This is the critical stage in the pig's growth, for up to the age when the pig begins to fend for itself, nature sees to it that the food is suited to bodily requirements. The change from sow's milk to other foods should not be too sudden. A gradual change is made by allowing the young pigs extra food while still sucking the sow. No pig's food is complete without water. It is not, however, desirable, as stated already, to attempt to compel the pig to consume a large quantity of fluid, but rather to provide plenty of fresh, clean water, so that the young pigs may drink as often as they want to.

Balance in the Ration.—A study of the chemical make-up of foodstuffs and of the way in which they should be balanced in the preparation of rations for pigs will be well repaid. The principal items are proteins (flesh-formers), carbohydrates (fat-formers), minerals essential in the building up of a strong bony system, and vitamins, without which the pig cannot develop as it should. Vitamins increase the pig's powers of resistance to disease.

Proteins may be added through the use of green foods like succulent green lucerne, grasses, herbage, and green crops, and by the use of concentrated meals such as meat meal. Carbohydrates are usually fed in the form of grain—maize, wheat, or barley—and cereal meals.

Minerals may be added as required through the use of mineral mixtures; they are also present in meat and bone meals. Vitamins are provided in succulent green foods, and, of course, completely balanced rations.

Cleanliness is essential in a piggery; and the animals should be allowed plenty of paddock room for grazing.

CASTRATION OF PIGS.

Male pigs must be castrated while they are very young, so that they may be fit for slaughter on attainment of the correct weights. The age recommended for the operation is six weeks, or two weeks before they are weaned.

As many beginners do not know how to perform the simple operation of castration, the Department of Agriculture and Stock has made available, free of cost, a very useful and well-illustrated pamphlet—"Castration of Pigs"—which gives detailed instructions in convenient form and in everyday language.

Demonstrations may be arranged, on application, in the course of the instructors' itineraries, either at gatherings where facilities exist for performing the operation, or at a slaughter-yard where young pigs are available. In the latter case it is preferable to demonstrate on a pig carrying more age—say, up to four months—and which can be killed and dressed beforehand. Demonstrating on a dressed porker simplifies procedure, and enables the instructor to explain it without the inconvenience of handling a live pig.

That a better knowledge of the operation of castration is essential is emphasised frequently by bacon factory officials, meat exporters, and slaughtering inspectors, who often come across carcases of male pigs which have been castrated improperly. Partial, if not total, condemnation of the hindquarters—the result of abscess formation—the formation of tumours in the scrotum, callous or improperly healed tissue, or some other abnormality—is the inevitable result.

Castration should be performed during cool dry weather and before flies—blowflies in particular—become numerous. Absolute cleanliness in all details, proper equipment, healthy growing pigs, and a correct knowledge of the job are necessary for success in the performance of the operation.

—*E. J. Shelton.*

PASTURES FOR PIGS.

Although young pigs will not grow rapidly if given only bulky foods—such as pasture—because of the limited capacity of their digestive tract, approximately one-third of their diet may consist of good pasture. In the case of dry sows, four-fifths of the diet may be provided as pasture.

Pasture, being relatively cheap fodder, should be used to the greatest economic capacity in pig feeding. Not only does grazing provide pigs with cheap food, but it provides a measure of insurance against deficiencies of minerals and vitamins which are likely to occur when pigs are intensively housed and hand-fed.

Pigs require a relatively high proportion of protein in their food, and they are unable to cope with large amounts of fibre; it is, therefore, desirable to graze pigs on pasture or forage crops when they are young and succulent.

Annual forage crops have the advantage of yielding large quantities of green feed in a short time; also, the practice of ploughing and planting pig paddocks twice a year is a satisfactory method of providing sanitation and control of parasites in the piggery. However, some permanent pasture is usually desirable in the piggery, but it should be stocked lightly and given frequent rests to preserve the stand and to prevent fouling of the paddock.

Wherever it can be grown, lucerne provides the best permanent pasture for pigs, but to prevent the pigs from rooting and spoiling the lucerne plants their snouts should be either cut or ringed. When lucerne cannot be used, Kikuyu grass is a very good substitute. Kikuyu has the advantage of being able to withstand severe grazing and rooting, and will quickly recover from drastic treatment by the pigs. It is a palatable and nutritious grass, and will thrive under a wide range of climatic and soil conditions.

—*L. A. Downey.*

LOSSES AMONG YOUNG PIGS.

Of all the difficulties with which the pig raiser has to contend, none involves such heavy financial loss as that associated with mortality in young pigs prior to the stage, and age, at which they are ready for market. Probably 25 per cent. of the average litter of pigs is lost before the weaning age (eight weeks).

The commonest cause of death before weaning is lack of attention at the time of farrowing, a number of pigs being suffocated at birth or killed by the sow. Premature birth also causes considerable loss.

It must be remembered that pregnant sows may be underfed and improperly prepared for farrowing in several ways. Lack of succulent green food, drinking water, mineral matter, readily digestible food, and also want of exercise, are frequent causes of trouble at farrowing time.

The remedy on many farms lies in providing necessary supplements to the food supply.

Strict limitation of the food supply a day or two before farrowing is necessary. Careful feeding, a clean, dry, nicely-bedded pen with suitable farrowing guards, and quiet surroundings in which the sow can settle down are very important.

Losses after weaning also are unusually heavy where management is slack. The period dating from the eighth to the twelfth week after birth is one of the most susceptible in the life of a pig. The system adopted should aim at feeding the young pig in such a way that there will be no check in growth before, at the time of, or after weaning. Care should always be taken to minimise the "shock" of the change over from the sow's milk to other foods by providing, for instance, a separate pen in which the young pigs can feed apart from the sow.

The greatest check in growth results from the young pigs having to contend with older pigs at the feeding trough. Additional hindrances are overcrowding, filth, dampness, parasite infestation, and lack of clean drinking water.

—*E. J. Shelton.*

BRANDING OF PIGS.

Under the Queensland Pig Industry Act, the identification of all pigs sold, offered for sale, barter, or exchange, is compulsory. This is essential to satisfactory marketing of this class of stock, and where marking is carried out as a regular routine job, it presents little difficulty. Identification facilitates investigation into disease, whether epidemic or otherwise.

The Act provides particularly for the marking of all pigs consigned to factories, and there has been widespread appreciation of its value. There may be differences of opinion in regard to the advantages of various systems of identification; but, from a factory point of view, it is a very great advantage to have the carcases plainly identified.

Exporters prefer the body tattoo as a means of identification, and bacon-curers almost without exception are more than satisfied if the carcases are tattooed efficiently. The use of the firebrand is being superseded generally by the more efficient method of tattooing, in which a body-tattooing instrument and marking paste or ink are used.

The marking of sucker, weaner, and store pigs presents greater difficulty, because neither the body tattoo nor the firebrand are sufficiently permanent where the pigs are to be retained on the farm for periods varying for two to five months. In the case of these young pigs, two systems are especially adaptable, viz., earmarking and ear-tattooing, the latter being suitable only in the case of white or red coloured pigs.

The departmental pamphlet, "Identification of Pigs," is available free on application to the Department of Agriculture and Stock, Brisbane.

OBJECT OF REGISTRATION.

THE registration of hatcheries has for an object the distribution of healthy chickens, the progeny of parent stock of good type and production ability.

The following clauses of Regulation 29 of "*The Diseases in Poultry Acts*, 1923 *to* 1937," will indicate the obligations of owners of Registered Hatcheries:—

(iv.) He shall have all poultry at or upon or kept at or upon such hatchery tested for pullorum disease at the times and in the manner from time to time required by the Chief Poultry Expert. He shall pay to the Minister the cost of every such test.

(v.) He shall not place, permit, suffer, or allow to be placed in any incubator at such hatchery for the purpose of incubation, any egg which shall be less than 2 oz. in weight.

(vi.) He shall not sell or offer for sale any chickens other than chickens which are healthy and normal and shall not sell or offer for sale any chickens which are deformed or injured in any way, or which have weak navels.

(vii.) He shall at all reasonable times permit the Chief Poultry Expert, any Inspector, or any officer to enter into or upon such hatchery and inspect the same.

Following is a list, giving the names of the owners of hatcheries registered up to and including 30th June, 1938:—

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana..	Nevertire ..	White Leghorns, Australorps, Rhode Island Reds, and White Wyandottes
F. J. Akers, Eight-mile Plains ..	Elmsdale ..	White Leghorns and Australorps
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard ..	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
T. G. Crawford, Stratford ..	Rho-Isled ..	Rhode Island Reds
Rev. E. Eckert, Head street, Laidley	Laidley ..	Australorps, White Leghorns and Langshans
Elks & Sudlow, Beerwah ..	Woodlands ..	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
J. W. Grice, Loch Lomond ..	Quarrington ..	White Leghorns
C. & C. E. Gustafson, Tannymorel	Bellevue ..	Australorps and White Leghorns
F. J. Lambert, Acacia Vale, Townsville	Lamberts ..	Australorps and White Leghorns
J. McCulloch, White's road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns
A. Malvine, junr., The Gap, Ashgrove	Alva	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington ..	Australorps, White Leghorns, and Black Leghorns
J. A. Miller, Racecourse road, Charters Towers	Hillview ..	White Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
F. J. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Sussex, Rhode Island Reds, and Brown Leghorns
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
E. E. Smith, Beerwah	Endcliffe ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
P. A. Wright, Laidley	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg Young's ..	White Leghorns, Brown Leghorns and Australorps

INCREASE EGG VALUES.

The well-fed hen produces an egg of maximum food value, and it rests with the farmer to maintain this quality in order to obtain the maximum value.

Quality and size govern price, quality being the more important. The lack of size is something easily determined, and by using for breeding only birds that lay large eggs, small eggs can almost be eliminated from the market.

Cleanliness of shell is the first essential in the satisfactory marketing of eggs. There is only one degree of cleanliness, although there may be several degrees of dirtiness. Cleanliness can be ensured by providing nests in which clean litter or nesting material is kept, and by gathering the eggs at least twice a day.

Water is usually used for cleaning eggs. It should be changed from time to time, and the cloth used rinsed at frequent intervals. Before the eggs are packed they should be dried thoroughly to prevent deterioration. Packing should be done in cases and fillers, as the use of materials, such as chaff, soils the eggs; there is also the risk of infection of the egg content by moulds. This infection gains entrance through the pores of the shell.

At the bottom and top of the case, pads of wood-wool or other suitable material should be placed to act as a cushion. Exceptionally large eggs should always be packed on the top layer to avoid breakages, and if petrol cases are used only five layers packed per case.

As the quality of an egg deteriorates with age, frequent despatch to market is necessary to obtain the highest values. During summer, eggs should be railed twice weekly, and during winter at least once weekly.

Pending despatch, eggs should be stored in a cool place free from odours, for taints are readily absorbed by the egg.

Many poultry farmers may not have a sufficient quantity to forward case lots twice weekly. To them, it is suggested that consideration be given to the possibility of combining with neighbouring farmers who are in a similar position.

The increased returns that will follow as the result of a little care bestowed on the egg to maintain quality will repay any farmer.

—*P. Rumball.*

CARE OF GROWING CHICKENS.

The age at which chickens should leave the brooder is largely dependent on weather conditions. Although artificial heat and brooding may be dispensed with when the chickens are four weeks old, it is not desirable to remove them from the brooder house until they are about six weeks old. Poultry of any class do not take kindly to strange quarters, and as there is a wide difference between conditions in the brooder houses and the rearing pens, it is well to teach the chickens to perch before removing them, thereby minimising, to some extent, the effect of a change in conditions.

As the brooding of chickens of mixed ages is undesirable, so is the rearing—particularly during their early life period. When chickens are being shifted from the brooder house to the rearing pens, it is desirable to separate the males from the females, and rear them in separate quarters. This applies particularly to light breeds, such as Leghorns and Anconas. The heavy or dual-purpose breeds may be allowed to run together until they are eight or nine weeks old. Although heavy breeds do not develop reproductive characteristics early, because of the disparity in size between males and females, separation of the sexes is desirable for obvious reasons when the chickens are at the age of nine or ten weeks.

—*P. Rumball.*

REARING OF CHICKENS.

The successful rearing of chickens is one of the most important points in poultry farming. Any setback which chickens receive, especially during the brooding stage, will be reflected in their development. Too much trouble cannot be taken to ensure that the chickens are reared under the most satisfactory conditions that circumstances will permit.

A reliable brooder is one of the first considerations—one that will generate sufficient warmth in the coldest weather to prevent the chickens packing together to get warm; and, at the same time, provide for plenty of fresh air. The brooder should be so constructed that the chickens can move away from the heat if the temperature is too high, and get back again without any obstruction. Much of the wastage of chicken life could be avoided if due regard were paid to these fundamental factors in brooding.

—*J. J. McLachlan.*

FOWL MANURE.

Poultry are usually fed a ration rich in protein, and consequently their excrement is rich in nitrogen. The arrangement by which intestinal and kidney waste products are voided together makes the nitrogenous products of fowl manure largely soluble.

It follows that care must be taken in storing fowl manure to see that no loss by leaching occurs. This may be done by storing it under cover in peaked heaps, or by mixing it with sand or friable earth which will absorb the soluble plant food.

Its high nitrogen content makes fowl manure a forcing fertilizer—usually termed "strong"—so that while its use for rapidly growing vegetables and strawberries is advocated, admixture with superphosphate and potash is advisable for most other crops.

GREEN FEED FOR CHICKENS.

An abundance of succulent green feed from the time chickens are a week old onwards will keep the birds healthy and help in their development. Stalky crops—like lucerne and barley—should be cut finely, but rape, kale, and similar types of green feed can be given without being chaffed.

Green stuff can be fed twice daily between other feeds, and when the chickens are accustomed to it they should be given as much as they will eat, without leaving any of it to wilt.

—*P. Rumball.*

WASTED LAND.

There is a good thought in what an English farmer said recently. "Fortunately for us in England," he remarked, "we have no such titanic problem of combating the results of farming for immediate profits and taking absolutely no thought for the morrow. Our land was always too limited in relation to the number of the population to allow us to be so extravagant, although now and then foolish attempts have been made to cash the accumulated fertility of the soil and leave the future in the hands of destiny." The quotation is from *The Farmer and Stockbreeder* (England).

Agricultural Notes

Rubber Tyres for Farm Machinery.*

H. W. KERR.

FARM TRACTORS.

THE use of rubber tyres for farm tractors is rather a new development which would appear to have prospect of substantial expansion in the near future. Low-pressure tyres of this class were introduced to Australian agriculture in 1934; they usually carry 10 to 12 lb. of air pressure in the rear and 24 lb. in the front-wheel tyres.

This equipment has been extensively studied by certain of the Agricultural Experiment Stations of the United States, and it may be of interest to Queensland canegrowers to review some of the conclusions reached at Ohio.

Rolling Resistance—Steel Wheels with Lugs *v* Pneumatic Tyres.

The tyres used in the tests were 11·25 × 24 rear and 6·00 × 16 front. The significance of this test is that the lower the rolling resistance, the less power will be required to move its own weight over the ground, thus resulting in fuel economy. On both ploughed land and on sod, the rubber-tyred tractor required substantially less power to move it than did the same tractor with steel wheels. The reduction in power was of the order of one-half, and it is interesting to note that the rolling resistance of the rubber-tyred tractor on ploughed ground was less than that of the steel-wheel tractor on sod.

One of the major reasons for the differences lies in the fact that power is consumed in forcing the lugs into the ground and removing them as the tractor moves onwards. The force required is, of course, greater on grass land than on ploughed land.

Fuel Consumption—Steel Wheels with Lugs *v* Pneumatic Tyres.

The tractor was in this case required to pull a subsoiler at different depths and various rates of travel. The rubber-tyred tractor showed a lower fuel consumption in practically all tests. Only on ploughed land,

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* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for October, 1938.

at light draw-bar pull, was the steel-wheel tractor superior. Moreover, the rubber-tyred tractor operating in third gear had greater fuel economy than the steel-wheel tractor in second gear. The greater draw-bar pull of the former was due to the much reduced slippage which was experienced.

Summarising all tests (with tractor operating uniformly in second gear, on sod and ploughed land), the average fuel consumption for the two units was—

Rubber-tyred ..	1·84 lb. per hour per H.P. at draw-bar.
Steel-tyred ..	2·02 lb. per hour per H.P. at draw-bar.

When the rubber-tyred tractor was operated in third gear, the disparity in fuel used was even greater.

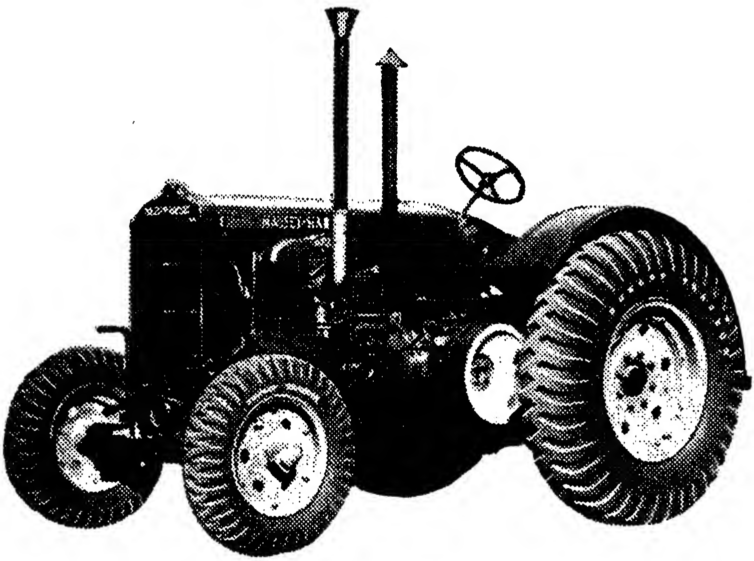


Plate 196.
Showing a tractor equipped with pneumatic tyres.

Ploughing Test—Steel Wheels with Lugs *v* Pneumatic Tyres.

The results of this test are summarised in the following table:—

——	Steel wheels.	Rubber tyres.
Area ploughed	0·79 acre	0·79 acre
Depth of ploughing	6·89 in.	6·82 in.
Time taken	45·1 mins.	35·3 mins.
Rate of travel, miles per hour	3·53	4·50
Fuel used—pounds	12·8	9·7
Fuel used—pounds per acre	16·3	12·3

The ploughing was carried out on a field of mixed lucerne and grass sod. Very little trouble was experienced in securing sufficient traction with the rubber tyres, even in the mornings when the grass was wet and the soil somewhat slippery. It was, however, necessary to change the hitch on the plough to cut the desired width of furrow.

It was also found that a greater maximum draw-bar pull was provided by the tractor with rubber tyres than with steel wheels and lugs. The superiority of the rubber-tyred tractor was more pronounced at higher speeds.

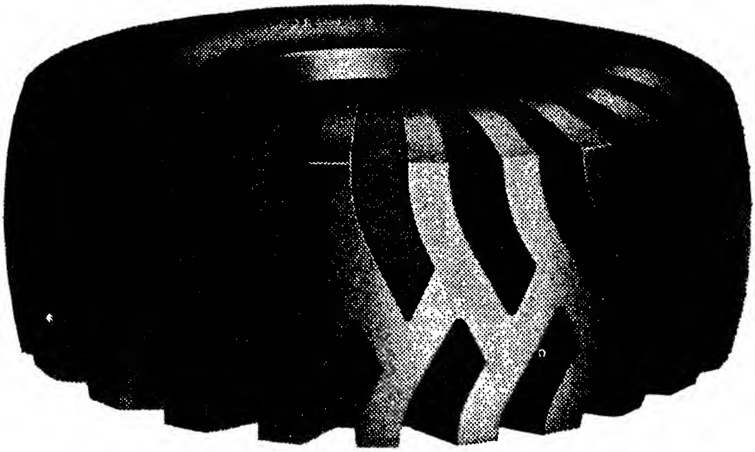


Plate 197.
Illustrating a tractor rear rubber tyre.

LIFE OF RUBBER TYRES.

Observations made on a tractor which had been operated for 1,349 hours, on all manner of farm work, showed little sign of abrasive wear. They suffered most wear by chipping, though this was not serious, and

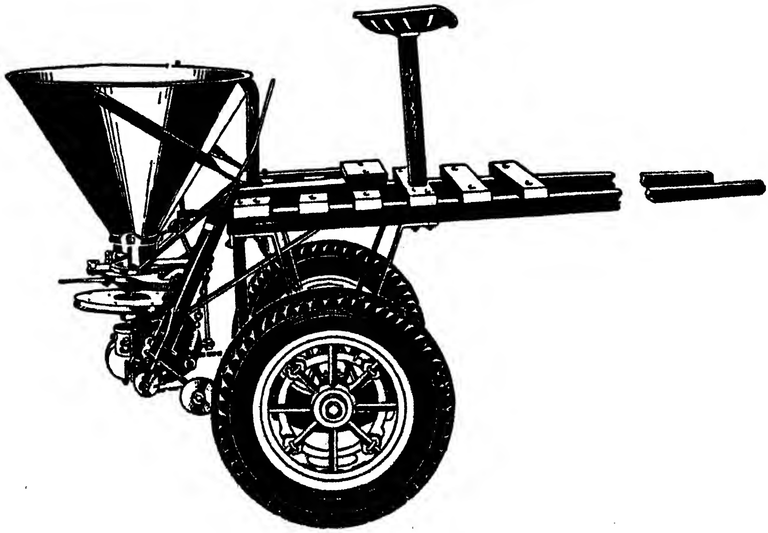


Plate 198.
Illustrating a lime distributor equipped with rubber tyres.

was due to contact with sharp stones. During the period, the rear tyre decreased in weight from 98·3 to 94·3 lb.; the front tyre decreased in weight only ½ lb. Only two punctures were experienced.

GENERAL OBSERVATIONS.

The amount of dust raised in dry soil is much less with the rubber-tyred tractor. Under most conditions it also rides easier, though in badly ridged land it "bounces" considerably. This can be overcome by inflating the rear tyres slightly. Rubber tyres also pick up less material than do the steel wheels with lugs.

It is concluded that for most farm operations rubber tyres are very satisfactory. They are especially desirable for transportation work (or travelling over roads where grips must be removed from steel wheels). Where land is wet or sticky, chains may prove of some assistance to the rubber tyres, but it is better to stay off such land.

To get the best results with pneumatic tyres, it is necessary to add weight to the rear tyres; this had actually been done in the tests discussed above. For a tyre 11·25 × 24, for example, the weight per wheel should be not less than 750 lb. A very useful and convenient means of effecting this is to apply weight in the tyre by means of water. This is done by filling the tube up to half-full of water, and inflating the remaining space to normal operating air pressure.

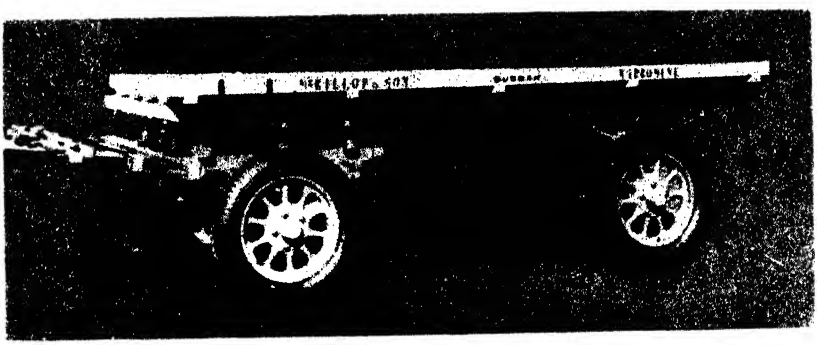


Plate 199.
Showing a waggon fitted with pneumatic rubber tyres.

FARM WAGGONS AND TRAILERS.

Though many horse-drawn commercial delivery vans equipped with rubber tyres have been in use in North Queensland for many years, the idea has not been adopted to any extent by canegrowers. Combined with the use of rubber-tyred tractors, it is probable that such waggons and trailers will be more widely employed in the future for such purposes as cane carting, when the need for a motor truck may be largely displaced.

It has been found that, due to the larger bearing surface of rubber tyres over the steel tyres of the ordinary farm dray, there is less penetration of the surface and hence a lower tractive power required. On

carefully conducted tests, the following tractive power was required for comparative loads:—

—	Power required—	
	Over grass.	Over soft ground.
	H.P.	H.P.
Wheel with iron tyres	1·1	1·9
Wheel with pneumatic tyres	0·6	1·4

The rubber tyre also causes less damage to pasture land than does the iron rim.

An important feature of the rubber-tyred vehicle is its low construction, due to the smaller wheels. This greatly facilitates loading and discharging. It is interesting to note, also, that in the tests made, roller bearings did not offer much advantage as regards tractive power—the rubber tyre was the most important factor.

The "Electric" Fencer.

A DEVICE which was recently brought on to the market, and which is attracting considerable attention from farmers, is the so-called "electric fencer." It consists of a small, compact unit, operated by a dry-cell or storage battery, which maintains sufficient pulsating voltage in the insulated wire of the fence to give any farm animal coming into contact with it a strong sting, which makes the animals wary of it thereafter. It is pointed out that the amount of electricity which flows, when contact is made, is so small that it cannot cause any harm to man or beast.

It is claimed that fencing costs can therefore be reduced substantially, as a single wire is sufficient to restrain all classes of farm animal, even the most persistent fence breakers. Moreover, ordinary barbed wire is suitable, supported by light stakes at intervals of 40 or 50 ft. apart. The wires are fastened to the stakes through small porcelain insulators, and it is stated that one unit will effectively charge 20 miles of insulated fence..

The stock are trained to respect the fence, by tempting them to come into contact with a charged wire; after one or two contacts, they will "leave it alone." Horses, cattle, and pigs are readily trained; it takes a little longer with sheep.

A dry-cell battery will remain effective for about two months, while a 6-volt storage battery would require recharging at about four to six week intervals.

The possibilities of this scheme have already attracted the attention of Cane Pests Boards, one of which is considering its value in keeping wild pigs out of cane paddocks. It is certainly an experiment which can be carried out very cheaply, and offers prospects of success. It may also prove useful in areas where wallabies are pests, and where netting would prove too expensive.

The cost of the unit without battery, is a few pounds, and we will be pleased to arrange for full particulars of the device to be forwarded to any interested canegrowers or organisations.

—*H. W. K., in The Cane Growers' Quarterly Bulletin.*

New Zealand Blue Lupin as a Winter Legume.*

N. J. KING and D. R. L. STEINDL.

IN the October, 1937, issue of the Quarterly Bulletin were reported the results of a trial with New Zealand Blue Lupin as a winter cover crop at the Bundaberg Station. So successful was this first experiment that a further planting was made during the past winter. The seed was planted on the 7th April, 1938, on an experimental block which was undergoing a long fallow.

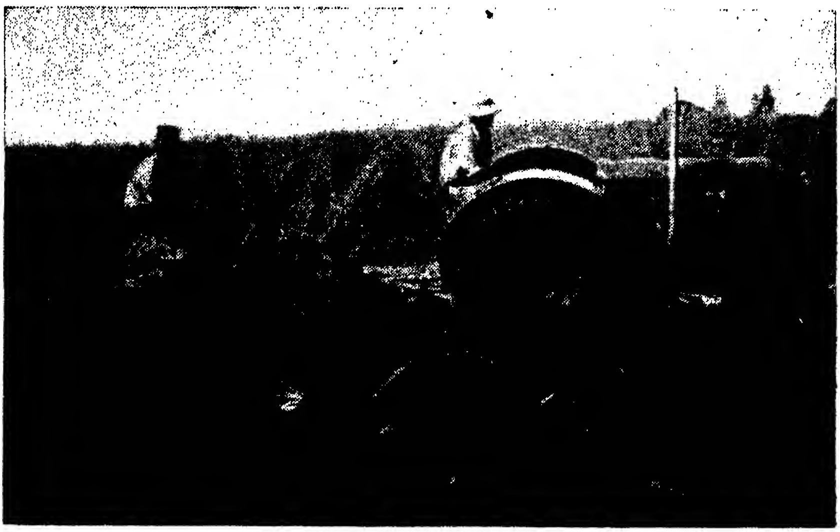


Plate 200.

Illustrating the heavy crop of Blue Lupin on the Sugar Experiment Station, Bundaberg.

On this occasion, 2 bushels of seed per acre were sown, with the object of obtaining a heavier crop. The field was harrowed in two directions after broadcasting the seed, and an excellent germination resulted. The double harrowing appears to be necessary to ensure coverage of the large seeds. The ideal winter rainfall of this year resulted in unchecked growth right through to time of flowering of the crop, which commenced about the end of August. By this time the crop was 5 feet 6 inches high, and had produced a heavy, erect growth of succulent material. Ploughing in presented no difficulties, and with a single-disc plough a good, clean cover was obtained (*see* Plate 200). The crop was in full flower and some young seed pods had already formed, but the plants were still remarkably soft and succulent, with no sign of woodiness in the stem.

When the crop was being turned in the plants were found to have numerous large bacterial nodules along the tap root. The bacteria in these nodules would naturally be expected to "fix" large quantities

* Reprinted from *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for October, 1938.

of atmospheric nitrogen, making it available to the plant, and thus increasing the store of nitrogen in the soil when the crop has decomposed.

At the time of ploughing in (7th September), small areas of the crop in different sections of the field were cut off at ground level and weighed. These weights, when calculated to tonnage, gave the very good average figure of just over 20 tons per acre of green matter, with no allowance for the underground portion of the plants. The farmer will recognise the humus-forming value of such a mass of succulent material, and at the present time there is available no other winter-growing crop which will produce such a large body of growth, and which will decompose so rapidly, while at the same time enriching the soil in nitrogen.

Plate 201.
Showing a portion of the crop of Blue Lupin grown on Windermere Plantation.

In order to determine the dry weight of the crop, and the amount of nitrogen added to the soil by it, several plants were cut and weighed green, then dried out and nitrogen determinations made. These showed the following highly satisfactory values:—

Weight of green crop	20 tons per acre.
Weight of dry crop	4·1 tons per acre.
Nitrogen in dry material	1·05 per cent.
Nitrogen contained in crop	97 lbs. per acre.

The quantity of nitrogen in the crop is, therefore, equivalent to an application of sulphate of ammonia at the rate of 485 lb. per acre. Moreover, it is in a form which would become available to the cane crop at a gradual rate during the ensuing few months after the rotting is complete.

A prolific crop of New Zealand Blue Lupin was also grown this year by Mr. C. Colquhoun, manager of Windermere Plantation (*see* Plate 201). The seed was broadcast at the rate of 2 bushels per acre, then harrowed in and rolled. Planting was carried out on the 26th April, and the crop was ploughed under during the first week in September. By the time it was in flower it had reached an average

height of 4 feet 6 inches, but was over 5 feet high in places. The growth was very dense and succulent, and no trouble was experienced in ploughing in.

Although the seeds were not inoculated the roots were found to be bearing large Rhizobium nodules similar to those found on the crop grown on the station. This would indicate that a suitable strain of the bacterium was present in the soil.

Another crop grown on a nearby property, however, was a comparative failure. An examination of the young crop showed that a large proportion of the plants were yellowed and wilting, and many had died. The roots and lower portion of the stems of these plants were found to be attacked by a fungus which was killing the tissues. This fungus was apparently very plentiful in this particular soil, or was favoured by the heavy rains during the autumn, but it is unlikely that it would become a general menace to lupin crops; it is thought advisable, however, to mention the occurrence of the wilt in this particular planting.

This crop appears to be particularly suitable for inclusion in a long-fallow system, but the ploughing in of a winter-grown leguminous crop naturally dries out the soil, and the use of such crops in dry areas is not advocated unless it is intended to delay planting until autumn, or at least very late spring.

FARMING IN THE MARANOA.

In the Maranoa district dry farming methods entailing summer fallowing are necessary for success with winter fodder. A more extensive use of the plough and harrows would do much to prevent heavy flock losses that may otherwise become an annual experience on small properties where native pastures are usually relied on. On these small holdings, if the conditions are suitable, mixed farming is recommended. This applies especially to the reclaimed prickly-pear country where a change from cattle to sheep is contemplated.

There is plenty of light, sandy loam and friable brigalow and belah scrub soil very suitable for dry-farming throughout the Maranoa district. In view of the progress already made, the time is now opportune for the utilisation of more of these types of soil for growing fodders, both for green feed and conservation as hay or silage.

Wheat, barley, and, on some of the better soils, lucerne grown during the winter give some insurance against the frequent dry springs; and 50 to 100 acres of land under these crops may well be the means of saving a large amount of money—the equivalent of the value of ewes and lambs that, otherwise, would be lost irretrievably. Summer-grown crops—such as Sudan grass, grain sorghums, cowpeas, and Japanese millet—will give a green bite for the flock when pastures dry off during summer; any surplus can be conserved as hay, stover, or silage.

—*C. F. Defries.*

Peanut Seed Treatment.

The difficulty encountered in obtaining a good stand of Virginia Bunch peanuts is well known to all engaged in this industry in the South Burnett district. The germination of the kernels after sowing is dependent on a large number of factors such as the moisture content of the soil, depth of sowing, tilth, and physical condition of the land. For example, with the same seed sample a poorer strike will be obtained on old land than on that recently broken up for cultivation which has better physical properties, largely because of a higher humus content. However, failures to obtain a good stand occur frequently, even when the conditions are quite good. In these cases, germination tests indicate that the seed is at fault.

Experiments have shown that this faulty germination of peanut kernels is dependent on two main factors—the method of shelling and the presence of fungus contamination. Hand-shelled kernels have given good germination when that of machine-shelled kernels has been poor. Also, the protection of the kernels from the injurious effects of invading fungi by treatment with fungicidal dusts has resulted in marked improvement in germination. The most reasonable explanation than can be advanced is that a certain amount of fine cracking and other injury occurs to the seed coat of the kernal during machine shelling, and that this injury permits the entry of fungi. The subsequent rot can be observed in the cotyledons or seed leaves of many of the seeds after germination occurs. When the rot spreads to the main stem the plant perishes. This occurs frequently before the plant emerges from the soil, but may also take place at any subsequent time.

The main purpose of these notes is to discuss the most practicable method of overcoming the difficulty. Satisfactory germination can be obtained by hand shelling the nuts or by the use of soaked whole nuts for planting. Both these methods have been used on a fairly large scale by a few growers at various times, but they are neither likely to be generally adopted because of the increased planting costs.

Using machine-shelled kernels, a reliable strike is only obtained after treatment with fungicidal dust. For this purpose the copper dusts are not nearly as effective as the mercury dusts. Of the latter, the two at present being marketed in Queensland—Ceresan and Agrosan—have both been tested with good results. In experimental work the dust has been applied at the rate of 1 oz. of dust to 20 lb. of kernels. The cost of treatment is low compared with the advantages. In fact, because of the lower planting rate which may be adopted, it will probably be found cheaper to sow with treated than with untreated seed. No definite ruling can be given as to the best planting rate, but the grower can work on the basis that he can use one-third less seed when it is treated. In recent experiments rates from 22 to 44 lb. per acre of treated kernels all gave satisfactory stands, but this has been tested in one season only. On the grounds of economy the grower will probably prefer a rate towards the lower end of this range. The experiments referred to proved a small but definite increase in yield from plots planted with treated seed.

In treating seed with mercury dusts, certain precautions need to be observed. The dusts are poisonous and should be handled with care.

They vapourise to a certain extent so they should be handled in a well-ventilated place—preferably out of doors. They also have a tendency to blister tender skin, and a little discomfort may be caused if the dust is allowed to accumulate between the fingers, particularly when the hands are moist. Treated kernels should all be sown and not be left where they are likely to be eaten by man or domestic animals.

However, the percentage of mercury in the dust is quite low and, with reasonable care, there should be no untoward results from its use on kernels for planting purposes.

Seed treatment can be confidently expected to improve the germination of Virginia Bunch peanut kernels. It cannot, however, improve the inherited qualities of the seed which, given good growing conditions, govern the cropping power of the plants. Seed treatment then while being highly desirable should not replace seed selection and the elimination of undesirable types from the seed plot—practices which are necessary for the maintenance of a high producing strain of seed.

—*R. B. Morwood.*

SEASONAL SOWINGS.

Land prepared for summer growing crops can be sown now with a variety of fodder, hay, and grain crops—such as maize, sorghum, millet, Sudan grass, and cowpeas. The majority of farmers recognise fully the necessity for making provision for recurring dry spells, and also for the winter months, when the growth of natural pastures is retarded considerably. In favourable seasons good results can be obtained by the cultivation of winter cereals and legumes; but it is to the more vigorous growing summer crops that stockowners must look for the provision of their chief requirements in hay, fodder, and silage.

Maize can be grown successfuly on a great variety of soils within the 30-inch rainfall region, deep alluvial soils being particularly suitable for its full development. Land ploughed deeply during the winter should be in good condition just now as a result of cross ploughing and harrowing; and it is well to remember that no amount of inter-row cultivation will undo the effects of sowing on hastily prepared land.

Maize crops are usually termed early or late, but as sowings may take place from August to late December, no definite sowing period can be recommended, weather conditions being the governing factor.

For grain purposes, the chief essential is to assure adequate moisture during the tasselling stage. Nine to ten pounds of sound seed to the acre will be found sufficient, sowing in rows 3 feet 6 inches to 4 feet apart; but for fodder or silage purposes double this quantity may be used, choosing a leafy variety such as Reid's Yellow Dent.

The sweet or saccharine sorghums also are widely grown throughout the dairying districts, as they provide a large bulk of nutritious and palatable fodder.

Although slightly less nutritious than maize, the sorghums will withstand dry conditions much better, while they also retain their succulence for a period after maturity, making them specially valuable as early winter feed. In cultural requirements the crop is somewhat akin to maize, sowing being done in rows 3 feet to 3 feet 6 inches

apart, which will be found to utilise approximately 5 lb. seed per acre. Sorghums frequently are sown broadcast; but although a finer stalk is produced, the total yield is reduced often by this method, besides which, weed growth is apt to be troublesome during the early stages of growth.

For silage purposes sorghum should be cut when the grain is well formed yet still in the soft dough stage. Saccaline imphee and White African are popular varieties.

Where a quick-growing summer grazing or hay crop is desired the millets can be recommended confidently, as they will produce fair crops even on the poorer soils.

The seed usually is drilled or sown broadcast, at the rate of 12 to 15 lb. per acre, and under favourable conditions the resulting crop will provide good grazing within five or six weeks. However, it is preferable to exclude stock until the plants are 8 inches to 12 inches high, when the roots will have a sufficiently strong hold to withstand grazing.

For hay purposes millets should be cut when the grain is in the soft, doughy stage; and, if a binder is used, small sheaves should be made and stooked in windrows. The varieties known as Japanese millet and white panicum have given the best results.

Sudan grass also is excellent for grazing or silage purposes, and is considered to be the best possible summer crop for the drier farming area, such as the Western Downs and Maranoa.

It is better to drill in the seed, using approximately 7 lb. per acre; but for broadcasting double the quantity will be required. The risk incurred in allowing stock access to Sudan grass prior to the flowering stage has been stressed often; however, the risk is taken by many experienced stockowners who have fed the crop during all stages of growth without ill-effects.

The cowpea now is widely recognised as a valuable green manure crop, resulting in the development of a good trade in locally grown seed. Its profitable utilisation as a fodder crop is also receiving attention by progressive dairymen, as it is highly nutritious, provides a good bulk of fodder, and is valuable as a rotation crop. Stock can be readily accustomed to green cowpea by sowing in conjunction with maize, either in the maize drills or in alternate rows. The seed varies greatly in size according to variety, so that, when sown in drills 3 feet apart, from 5 to 15 lb. seed per acre will be necessary. Poona, groit, and black are popular varieties.

With all spring-sown crops much better results are obtained when inter-row cultivation is carried out thoroughly, although, as previously pointed out, the initial preparation of the land, involving winter fallow, is of primary importance.

SEED WHEAT.

All crops of grain are not suitable for seed. To be fit for this purpose, grain should be true to variety, free from barley, black oats, and weed seeds, with an absence of flag, ball, and flying smut—particularly the lastmentioned, which is much more difficult to deal with successfully than ball or flag smut. If a careful inspection reveals that a crop will be suitable for seed, after a little roguing or the

removal of strange wheats, barleys, oats, or other foreign growths, before being harvested, selection should be made from an area in the middle of a paddock sufficiently large to provide the quantity of grain required. By making the seed reservations from the position in a field of wheat—the last sown, as well as the last to be harvested—the risk of contamination by the introduction of other varieties through the medium of the seed drill and harvesting machinery is reduced to a minimum.

Although a seed reservation cannot be protected from hail, the risk of loss by fire can be reduced very considerably by cutting for hay, say, a swathe half a chain in width round each paddock and ploughing or sundercutting the cut-over ground. Where the areas are large, they should be cut into sections—say, from 100 to 200 acres in extent—as a precautionary measure, thus facilitating harvesting and providing a valuable reserve of wheaten hay.

JERUSALEM ARTICHOKE.

Like the sweet potato, the Jerusalem artichoke should attract much more attention as a crop than it does at present, more particularly by pig raisers in the drier farming districts, for not only is it drought-resistant, but its tubers are highly nutritious as well. The yield, which is controlled by the soil and seasonal conditions, may range from 6 to 8 tons or more per acre; and although the plant does best on good friable loams, it will thrive on sandy, gravelly, or clayey soils, which enables the poorer patches of soil on the farm to be put to a profitable use.

The area intended for Jerusalem artichokes should be prepared in much the same way as for potatoes. The crop may be planted in early spring in furrows 3 feet apart, with the sets 2 feet apart. This spacing with medium-sized tubers will entail the use of between 4 and 5 cwt. per acre.

As with maize and potatoes, until the crop is 4 inches high, all cultivation can be done with tined harrows working across the drills. Afterwards, the cultivator will have to be used as the condition of the soil and weed growth necessitates.

—*R. E. Soutter.*

MELILOT OR HEXHAM SCENT.

Every spring numerous specimens of this plant are received from farmers in different parts of Queensland for identification, and a few notes on its properties may not be out of place. It is most abundant on the Darling Downs, but during the present season specimens have been received from the central West and from the coastal North. It is a native of Southern Europe, but is now widely spread as a naturalised weed in most warm-temperate and sub-tropical countries.

It was boomed as a fodder under the name of King Island Melilot some years ago, but our experience in Queensland has been that stock do not take readily to it, and have to become accustomed to the peculiar odour and flavour. It has the great disadvantage of tainting milk and cream rather badly. It is short-lived, being at its best during the spring months, dying off at the approach of hot weather towards the end of

October or early November. As a fodder plant for Queensland for winter and spring months it is poor compared with some of the annual trefoils and clovers, such as the common burr trefoil and cluster clover.

It is a common weed of wheatfields, and if reaped with the wheat and stored for any period the peculiar penetrating odour is communicated to the flour and bread subsequently made.

It is an upright plant, something like lucerne in appearance, but with small yellow flowers born in slender spikes. The seed pod is small, round, and encloses a single seed.

—*C. T. White.*

THE WORK OF SCHOOL PROJECT CLUBS.

THE Bureau* has always warmly endorsed those aspects of Project Club work in rural schools which centre on simple fertility trials, as a means of demonstrating the value of special plantfood materials in cane production. There can be no better means of impressing the value of this phase of technical agricultural knowledge on the youthful minds of those who will be our future cane farmers.

An excellent demonstration is afforded by a fertility trial recently harvested at the Mossman Rural School. The area of land devoted to the purpose was sufficient to permit of 15 plots, each $\frac{1}{30}$ acre, to be pegged out, thus providing three plots each of the five standard treatments normally employed in this work.

The fertilizers were measured and spread by the pupils, who maintained close contact with the plots until they were harvested, and the cane weighed, while the calculation of the actual yields also afforded a useful exercise. The plant crop yields showed—

	Tons cane per acre.
"No fertilizer" plots	16·3
N P plots	22·6
N K plots	15·5
P K plots	21·1
N P K plots	22·8

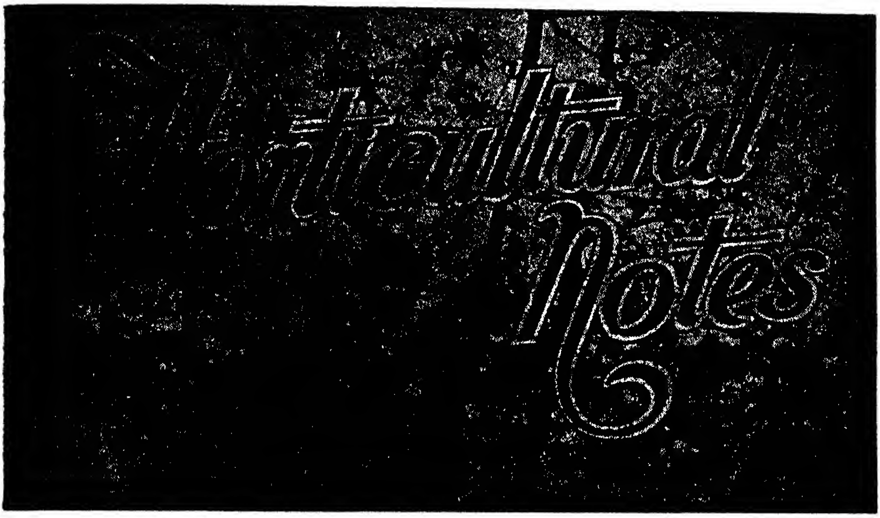
From these figures it may be deduced that—

	Crop increase.
(N P K − P K) or (22·8 − 21·1) =	1·7 tons due to N.
(N P K − N K) or (22·8 − 15·5) =	7·3 tons due to P.
(N P K − N P) or (22·8 − 22·6) =	0·2 tons due to K.

It is therefore evident that the soil is notably deficient in phosphate (P), which is remedied by applications of manures rich in superphosphate. The use of potash (K) has shown but little benefit, while the influence of sulphate of ammonia (N) has been quite definite. It should be pointed out that the area was green manured while in fallow, and therefore substantial results from sulphate of ammonia were not to be expected. It is interesting to record, however, that an application of this manure at the rate of only 60 lb. per acre seems to have improved the yield slightly.

—*G. B. and H. W. K., in The Cane Growers' Quarterly Bulletin.*

* Bureau of Sugar Experiment Stations, Department of Agriculture and Stock, Queensland.



Harvesting and Packing Cherries.

JAS. H. GREGORY, Inspector in Fruit Packing.

MOST of the cherries seen on Queensland markets come from other States, although the Stanthorpe district produces cherries which for quality compare favourably with the fruit imported from the South. Considerable improvement is possible in our marketing methods by the adoption of the 12-lb. cherry box, which is now the standard container for cherry-marketing.

The Cherry Box.

The box is commonly known as the ¼-bushel cherry case, with inside dimensions of 13¾ inches long x 10⅛ inches wide x 4 inches deep. Material required:—

Ends.—2 pieces 10⅛ in. x 4 in. x ½ in. thick (minimum).

Sides.—2 pieces 14¾ in. x 4 in. x $\frac{5}{16}$ in. thick.

Tops and Bottoms.—4 pieces 14¾ in. x 5¼ in. x ¼ in. minimum thickness.

Harvesting.

As Queensland cherries have to carry long distances, harvesting of the fruit should be done very carefully. As far as possible, all fruit should be picked from the trees in the early part of the day. As with all other stone fruits, keeping the temperature down is an important factor in successful long-distance carriage. It is far easier to keep fruit cool than to cool it down after it has become heated. Fruit should not be picked if wet by rain; otherwise fungous growths may develop. All care should be taken in the handling of the fruit, which should be reduced as much as possible. The fruit should be handled by the stalk only. If this is done with care, the fruit will be placed stalks upwards in the picking containers, and so make packing easier. Baskets or kerosene tins cut on the flat and fitted with handles make good picking equipment.

Grading.

Like all other fruits, cherries should be graded. Only well-coloured fully matured fruit should be picked and packed for the fresh fruit market. There are two types of cherries—dark and light fleshed. When picking dark-fleshed varieties, they should be fully coloured all over to a deep red. Light-fleshed varieties should be a creamy ground colour all over the skin surface, with a red flush. All cherries should be firm, and soft fruit should be rigorously rejected for market consignments.

Two grades are advised, the large fruit being separated from the small. As the use of "extra fancy" and "fancy" as grade designations are now used for most fruits, it is suggested that the large fruit be called "extra fancy" and the small "fancy. As a guide, it is suggested that fruit ¾ inches and over be called "extra fancy," and smaller fruit "fancy."

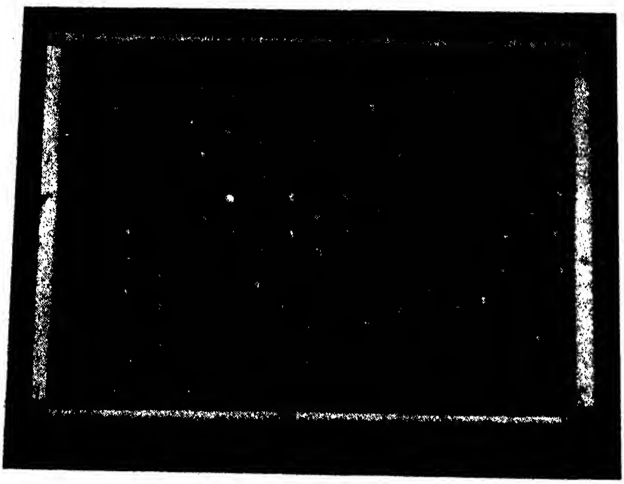


Plate 202.

A well-packed case of large cherries with the "face," packed in diagonal lines, paper lining only used.

Rejects.

It is repeated that too much care cannot be taken to exclude unsatisfactory fruit. Cherries showing the following blemishes should be excluded:—

Cracks, bird picks, fruit without stalks, fruit which has been squeezed or squashed slightly, and poorly coloured and misshapen fruit.

Packing.

After picking, the fruit should be taken as soon as possible to the packing shed and allowed to stand in the coolest part until packed. Packing the fruit is easy. One type of pack is used—the system of facing. Actually in this pack the top of the case is packed first. The case is prepared by lining with clean white or plain coloured paper or, for the best-class trade, by using a fancy thin cardboard or thick paper mask

or facing sheet. The mask is placed in the box. The cherries are then carefully placed in position with all stalks facing inwards. With the large sizes the fruit is placed in straight lines or in diagonal lines, according to the desire of the packer. When the layer is finished the case is filled with fruit layer by layer, care being taken that all stalks are placed upwards. During this operation all fruit is handled by the stalks; so it is readily understood how placing the stalks up in the basket when picking will help. The box is filled to slightly above the top, and the fruit is carefully placed into position by lightly bumping the box, which is then nailed up. When opened on the opposite side a well-packed "face" of cherries is seen, no stalks showing. The side the fruit is "faced" is always indicated to enable the salesman to

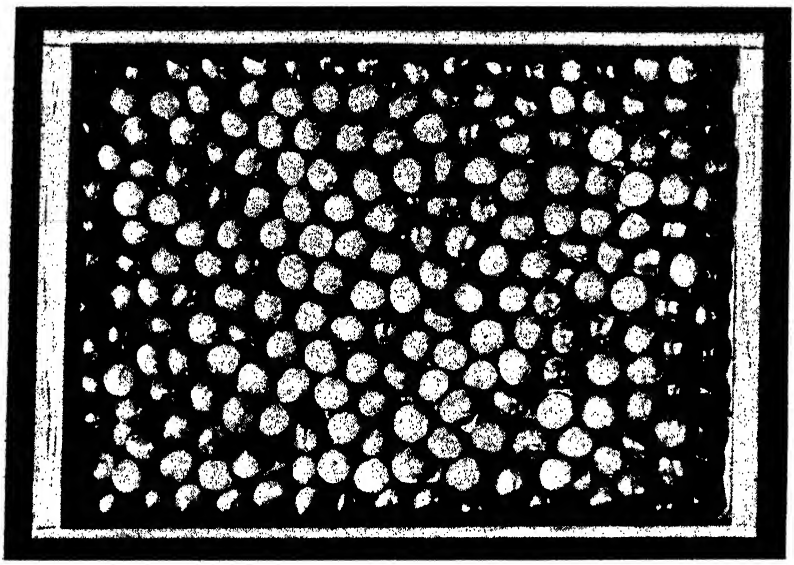


Plate 203.

Small cherries faced but not packed in straight lines.

NOTE.—This is actually the first layer of fruit to be placed in the case.

remove the correct boards for display. The same care in placing the fruit in straight lines when facing is not necessary with the small grade, although the fruit is placed in position with the stalks up (Plate 205). The following points for successful packing should be memorised by all packers:—

(1) Wet fruit should not be packed.

(2) Handle fruit by the stalks all the time.

(3) Cherries without stalks should not be packed.

(4) Blemished or damaged fruit should be rejected.

(5) Take care to indicate on the box the faced side of the fruit to enable the salesman to open for inspection in the right place.

Stencilling and Labelling.

The use of a "fancy" label is strongly recommended. It should indicate the contents of the case as cherries and have the following particulars embodied in the design:—

(Grower's name and address, name and grade of fruit.)

J. JONES,
BALLANDEAN,
QUEENSLAND.
CHERRIES. EXTRA FANCY.

The printing should be in letters not less than ½ inch in height. In stencilling, the same particulars are required. Stencils should be made with plenty of metal around the printing to remove the risk of brush marking when applying it to the end of a case.

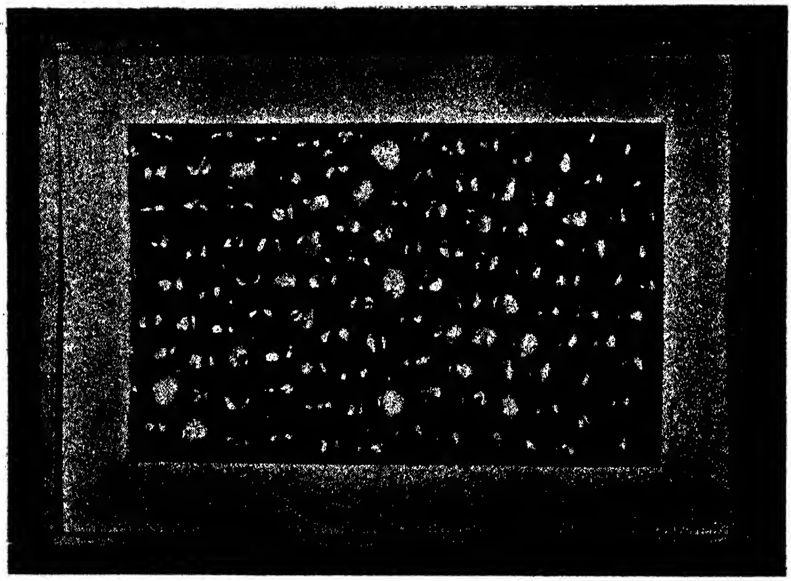


Plate 204.
A case of small-grade cherries with a thin cardboard mask used.

Label Paste.

For small quantities, ordinary flour paste is quite satisfactory. The addition of a small teaspoonful of powdered alum to each pint of paste will assist in keeping the paste from going sour.

Stencil Ink Pot.

A good stencil ink pot can be made from a handful of cotton waste placed with the stencil ink cake. The waste is kept wet while the ink is rubbed into it. The brush is dipped on the waste when using, clean stencilling being easy to do.

Stacking Packed Boxes.

After packing, the boxes should be stacked on their tops and bottoms during transit. Wood which is too thin should not be used for lids or bottoms, as it is necessary for the fruit to be protected as much as possible.

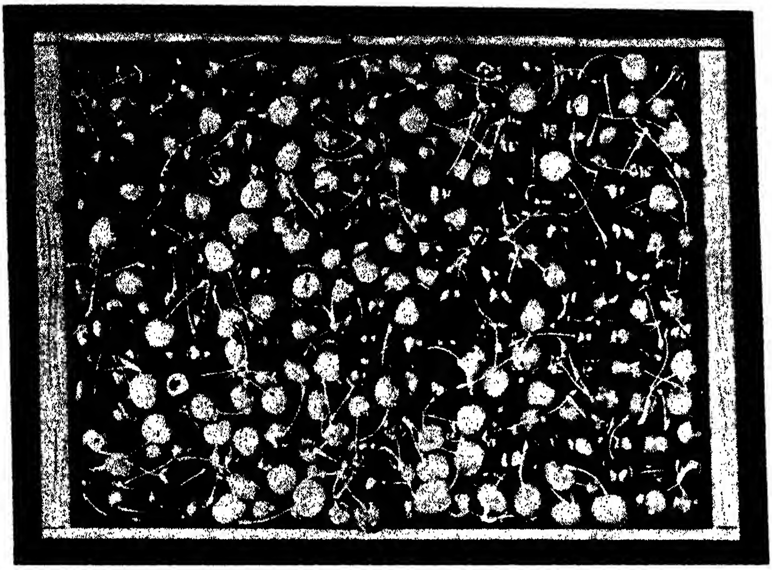


Plate 205.

The bottom layers of a case, showing how the stalks are all turned upwards when packing.

NOTE.—These layers become the bottom layers after the case is nailed down.

Maturity.

Growers will soon learn by experience the correct stage at which to harvest the fruit. The cherries must be far enough advanced to continue ripening, and, at the same time, firm enough to carry long distances. Variety has a big influence on the carrying quality of the fruit. Only the hard black or white varieties—such as the "Florence," "St. Margaret," and "Tartarian"—should be cultivated for long-distance trade.

The following salient points in marketing are stressed:—

(1) Select only hard, firm varieties for long-distance travelling.

(2) Grade into two qualities; it pays.

(3) Use the 12-lb. cherry case in preference to other boxes.

(4) Facing masks are well worth while for top quality.

(5) Keep fruit cool from tree to rail.

(6) Keep out stalkless and skin-broken fruit; it will breed brown rot.

THE PLANTING OF BANANAS.

The best aspect for banana-growing is one varying from easterly to northerly, and even north-westerly, provided that the plantation is well sheltered from strong winds. As southerly slopes are usually cold, banana plants, if grown on them, develop slowly, and the fruit is generally inferior—hence land with a southerly aspect is not worth considering if other land is available.

Logging and hoeing operations should, if possible, be followed by a thorough grubbing. Grubbing is essential if the plantation is to be established in forest soil. It is necessary for the aeration and drainage of the soil, and the maintenance of a supply of moisture for the plants. Many growers look askance at forest soils for bananas, but plantations on such soils, if worked thoroughly and desuckered carefully, can produce fruit of first-class size and quality.

It is now possible to plant bananas in many localities. If bits or butts are being utilised, careful attention must be paid to baiting for the banana weevil borer to ensure the planting of clean material. Growers in need of advice on the selection and preparation of planting material should get in touch with the nearest fruit inspector or banana agent.

Holes for planting should be, roughly, about 15 inches square by 15 inches deep. The surface soil from the top side should be raked back into the hole and the sucker placed in the loose soil and tramped firmly all round. The top of the sucker need only be covered lightly with loose earth, and the hole should not be refilled completely.

An application of about 1 lb. of fertilizer when planting will hasten and strengthen the growth of the young plants. The actual time of planting will depend on the conditions in the different districts. On a slow-growing aspect, October planting is best, while on warmer slopes November and December may be more suitable.

Where grubbing has not been done previously a circle around each plant with a radius of approximately 3 feet should be worked. This gives the plant both sufficient sunlight and freedom from smothering weeds. Planting 10 feet by 10 feet is a good average distance.

Generally, the best method of spacing followers is that known as "one bunch one follower." This enables the grower to regulate and handle his fruit cutting and packing with convenience, as it is more or less confined to the winter months. For about the first twelve months after planting, all but one or two followers should be kept back, and thus all energy is directed into one plant and its bunch. The folly of allowing as many suckers as may appear to develop cannot be condemned too strongly.

—*J. Freeman.*

THE CAPE GOOSEBERRY.

Actually, the Cape gooseberry is not a true gooseberry, being of the same family as the tomato, potato, and tobacco. This fact suggests immediately the class of soil it requires and what would be a suitable location for its growth.

The Cape gooseberry is best propagated from seed, 1 oz. being sufficient to plant an acre. Sow the seed in a carefully prepared seedbed in the same way as tomato seed is sown. Cover the seed to a depth of

half an inch, using a rich loam, with a fair percentage of dry horse manure, if possible. Keep the bed moist, but shading is not necessary under normal conditions. The young seedlings grow rapidly and should be ready to transplant in, approximately, eight weeks from sowing. Harden the plants off by reducing the watering gradually prior to removing the plants, but give the bed a thorough soaking immediately before lifting the young plants.

Plant in a well-cultivated field in rows 4 feet by 4 feet apart. Water the plants at the time of planting. If land requires fertilizing, apply as a top dressing 1 part of sulphate of ammonia to 2 parts of superphosphate. A small amount of sulphate of potash applied just before the fruit appears is an advantage.

Harvesting may commence approximately three months after transplanting. The season lasts two to two and a-half months, regulated to a large degree by the season of the year. A fair crop would be about 3,000 lb. of fruit per acre, although much heavier yields have been recorded from time to time.

The market price ranges from 4d. to 7d. a lb. locally. The demand for this fruit is good, with little chance of a glutted market. The fruit is sold as fresh fruit, or for jam or preserves.

The chief troubles affecting the Cape gooseberry are downy mildew (control by spraying with the Bordeaux mixture 4-4-50); and soft, brown scale (control by spraying with white oil 1 in 56). Annual planting is recommended, but, if pruned back, the plants do quite well for two seasons.

TABLE BEETS.

The beet will grow well in most soils, but, like other root crops, it does best in a light loamy soil. The soil should be prepared thoroughly and enriched with liberal dressings of well-rotted stable manure or vegetable matter.

Commercial fertilizers may be used, and the Agricultural Chemist advises the following mixture:—

Sulphate of ammonia	1½ to 2 cwt.
Superphosphate	2 to 3 cwt.
Muriate of potash	¾ to 1 cwt.

A complete fertilizer, 2-12-6, also, may be used at the rate of from 4 to 6 cwt. to the acre.

The fertilizer should be applied at the time of thinning if the seed has been sown where the plants are to remain; or otherwise at the time of transplanting. A top-dressing about a month later with sulphate of ammonia at the rate of 1 to 2 cwt. to the acre would be beneficial.

As the seed is usually sown in the field, it is necessary to have the soil in a fine state of tilth prior to planting. The seed is customarily planted in rows about 2 feet 6 inches apart for horse cultivation, or 1 foot 6 inches apart for hand. Six to 8 lb. of seed is usually sufficient to plant an acre, or 1 oz. to every 150 feet. It should be sown to a depth of from ½ inch in heavy ground to 1 inch in light soil. The seed is usually slow in germinating. The distance between plants may vary

from 3 to 4 inches, according to variety sown. Thorough cultivation is necessary after planting out, and until the plants are a fair size care must be taken not to injure them with the implements or heavy clods of earth.

Beets should be harvested when of suitable size for market. They are usually washed and tied in bundles of about six. Varieties recommended are—Nonpareil, which has a long oval shape; and Crimson Globe—a turnip-rooted, early beet, suitable for hot districts.

PACKING SHED HYGIENE.

Growers are advised to clean and prepare their packing sheds and equipment in readiness for the next fruit-picking season.

Sizing machines should be examined and all broken parts repaired. Projecting screws, nuts, or anything likely to damage fruit in the course of handling should be removed or padded. All picking cases and equipment should be scalded or sprayed with formalin—1 part to 20 parts water. Pits for the disposal of fly-stung rejects should now be put in order.

Citrus Fruits.—At the end of the season, it is often found that there is an accumulation of old fruits which, if left to decay, may be a prolific source of blue mould and other trouble when next season's citrus crops are harvested. This rejected fruit should be destroyed. Cases which have contained mouldy citrus fruits should be scalded and cleaned thoroughly.

Bananas.—No other section of the fruit industry is worse equipped for the packing of its produce than the banana section. No attempt, as a rule, is made to make the work easier by the use of labour-saving appliances. Many growers also do not bother about the first principles of sanitation around the packing shed. Old stalks and fruit are left piled about the premises to become a source of disease infection. Growers are strongly advised to remedy this state of affairs, should it exist, by providing for the destruction of all packing-shed refuse.

Pineapples.—The same recommendations are submitted to pineapple-growers. In addition, benches, picking baskets, and other equipment should be scalded and sprayed thoroughly at regular intervals as a measure of control of water blister and other disorders. Old tops, decayed fruit, and other litter should not be left around the packing shed.

Cleanliness in the packing shed and careful handling and packing will ensure the delivery of fruit on the market in an attractive condition. The influence of satisfactory consignments on prices is obvious.

HARVESTING TALL-GROWING BANANAS.

The "cutting" of bunches of tall-growing varieties of bananas frequently presents a difficulty to growers who have not had previous experience in growing varieties such as Mons Marie and Lady's Finger.

A very simple method that can be recommended, and one that can be operated successfully by one man is as follows:—

On the same side of the stem as that on which the bunch is hanging make two cuts with a cane knife, about 5 to 6 feet from the ground. The cuts are made one downwards and one upwards, and should meet, making an angle of about 60 degrees, approximately two-thirds of the distance through the stem, or deep enough to sever the bunch stalk in the centre of the stem. Immediately this is done, the upper portion of the stem with the bunch will not fall suddenly to the ground, but will slowly bear over, and as it gradually comes within reach the bunch is grasped and cut.

The principle of this method is that the soft fibrous tissue of the unsevered portion of the stem does not break suddenly, but because of its flexibility allows the bunch to heel over gradually. The V-shaped wedge also assists in this way: it cushions the lower and upper portions of the plant, and only gives way steadily and partly crushes under the increasing strain as the bunch nears the ground.

When cutting the stem, care should be taken to sever the bunch stalk. The tissue of this stalk is very brittle, and will snap readily. If this stalk is only partly cut, the weight of the bunch pulling the plant over will cause the unsevered portion to snap, and this sudden snapping will invariably result in the remainder of the stem also breaking and the bunch falling heavily to the ground to the detriment of the fruit.

LIME FOR THE GARDEN.

Lime is very useful in neutralising the excess acidity of the soil. It improves the physical condition of heavy acid soils, ensuring better drainage and aeration, and making cultivation easier, and it is an essential plant nutrient. When present in sufficient amount, it promotes some types of bacterial activity which convert the reserves of nitrogenous material in the soil into the soluble forms of nitrogen which plants utilise.

There is no foundation for the common belief that the exposure of acid soil to sun and air "sweetens," or reduces, its acidity. Acidity is developed through an insufficiency of lime in the original soil-forming material, or the loss of lime through leaching and absorption by plants. Acidity thus developed can only be counteracted in field or garden by the use of some form of lime. The forms of lime used for counteracting soil acidity are quicklime, hydrated or slaked lime, and ground limestone or carbonate of lime.

Slaked quicklime is formed by exposure to the air, causing it to become a very fine powder which can be spread quite easily. Ground limestone is a cheaper and more pleasant material to handle than slaked lime, provided the material is sufficiently fine and well distributed, and that equivalent dressings are applied. In the last respect, 4 lb. of ground limestone are required to supply as much "effective" lime as is contained in 3 lb. of slaked lime.

The soil to be limed should be dug over and reduced to a good tilth, after which the lime should be uniformly spread, and then lightly worked into the top soil to a depth of several inches. The amount of

lime to be used depends on the degree of acidity of the soil, its texture, organic matter content, and the type of plant to be grown. Unless all these features can be determined, suggestions on the amount of lime that it is necessary to add to a soil can be approximate only.

On loams and heavier soils, dressings may range from 1 lb. of slaked lime, or 1½ lb. of ground limestone, per square yard on loams, to double these quantities on clay loams and clays. Sandy loams or, still more, sandy soils can receive lighter dressings of approximately half the amount required for loams. Lime is lost most rapidly from sandy soils, which are usually more acid than heavier soils under the same conditions. Under garden conditions, with frequent waterings, lime is continually being lost, especially from the sandier types of soil. After the initial liming, which may need to be heavy to counteract strong acidity, it is preferable to add light dressings each season, rather than occasional heavy dressings.

It is not necessary always to add sufficient lime to neutralise soil acidity completely, as most garden plants grow well on slightly acid soils. This slightly acid condition will result only in the majority of garden soils after liming. Only for those plants listed below as very sensitive to acidity is it advisable to neutralise the acidity completely. Whilst many plants grow best on neutral soils, or on slightly alkaline soils, a considerable number of plants will tolerate fairly acid soils.

By careful planning of the garden cropping scheme, portion of the area may be set apart and only lightly limed, if at all, for certain plants (as indicated below), and the remainder limed for those crops with a higher lime requirement. Potatoes, which will grow on acid soils, do best on slightly acid soils, and in gardens where dry conditions are not experienced the danger from scab diseases in slightly acid soils is small.

The following statement shows approximately the relative sensitiveness of a number of garden and crop plants to acid soil conditions:—

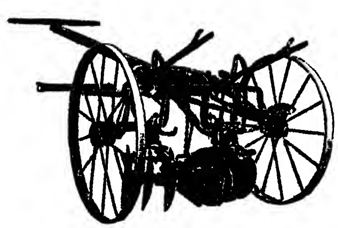
Very Tolerant.—Potato, radish, strawberry, sweet potato, rhubarb, water melon, pineapple.

Tolerant.—Bean, carrot, cucumber, turnip, crimson clover, maize, oats, tomato, cowpea, cabbage.

Sensitive.—Rape, red clover, sweet clover, white clover, peas, onions, lettuce, cauliflower.

FORCING CROPS WITH ELECTRICITY.

The French Academy of Agriculture has before it particulars of new methods of forcing growth in farm crops by means of electricity. Some of them are yet in the experimental stage, but one that was introduced tentatively five or six years ago is now reported to be making headway among French market gardeners. This method is simply an adaptation of the time honoured way of utilising the heat of the midden—ex-Diggers of the A.I.F. will remember the midden in every French farmyard into which all sorts of refuse was dumped—for forcing purposes. The same thing is now done with electricity. Electric cables are placed at the bottom of the bed and over them a layer of sand distributes the heat to the soil above. Because of the fact that the bed does not lose heat very rapidly, it is said to be practicable to restrict the use of the current. This method is said to be well adapted for raising seedlings and cuttings, and for certain special crops.



The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE first of the stone fruits—cherries—has arrived on the Brisbane market from New South Wales. For early consignments prices were high for choice lines, over 1s. a lb. being paid for the best.

Some local China Flats also made their appearance.

Mangoes are now well established on the market. Some lines of this fruit have been sent to market too green. Only fully matured consignments have any chance of realising top prices. Many northern growers are making the mistake of sending fruit too green, and also badly packed. There is a good market for this fruit, but it is only by good harvesting and packing methods that agents are able to obtain top prices. The warning against sending the common type of mango to southern markets is again repeated—this time with emphasis. Papaws and smoothleaf pineapples have been in heavy supply, and prices for all but prime fruit have been low.

Quality oranges are in demand, but agents have had great difficulty in selling small-sized fruit.

Prices for bananas have eased slightly in Brisbane, but remain firm on the southern markets. Many lines of fruit have been rejected for lack of girth and growers are warned against endeavouring to place fruit of this description.

Prices during the last week of October were:—

TROPICAL FRUITS.

Bananas—Cavendish.

Brisbane.—Smalls, 5s. to 7s.; sixes, 5s. to 8s. 9d.; sevens, 8s. to 13s. 9d.; eights, 8s. to 13s.; nines, 11s. to 15s.

Sydney.—Sixes, 14s. to 16s.; sevens, 17s. to 19s.; eights and nines, 20s. to 23s.

Melbourne.—Sixes, 9s. to 12s.; sevens, 11s. to 14s.; eights and nines, 13s. to 16s.

Lady Fingers.

Lady's Finger, 1½d. to 8d. per dozen.

Pineapples.

Brisbane.—Smooths, 3s. to 5s. 6d. per case, 1s. to 4s. per dozen. Ripley, 8s. to 10s. per case, 2s. to 6s. per dozen.

Sydney.—4s. to 7s. per tropical case.

Melbourne.—6s. to 8s. per tropical case.

Papaws.

Brisbane.—Yarwun, 4s. to 7s. tropical case; Gunalda, 3s. to 4s. bushel case; Locals, 1s 6d. to 2s. bushel case.

Sydney.—2s. to 11s. tropical case. Green fruit hard of sale.

Melbourne.—6s. to 8s. tropical case.

Mangoes.

Townsville best quality, 8s. to 9s. bushel. Immature fruit hard of sale.

CITRUS FRUITS.

Oranges.

Brisbane.—6s. to 7s. bushel; few specials higher. Small grades hard of sale, 2s. 6d. to 3s. 6d.

Lemons.

Brisbane.—Gayndah, 5s. to 11s. per bushel; Locals, 3s. to 6s. per bushel.

Grapefruit.

Brisbane.—6s. to 8s. per bushel.

Mandarins.

New South Wales.—8s. to 10s per bushel.

DECIDUOUS FRUITS.

Apples (Southern).

Brisbane.—Jonathan, 8s. to 14s.; Crofton, 11s. to 14s.; Granny Smith, 15s. to 16s.; Yates, 10s. to 14s.; Cleopatra, 7s. to 14s.; Sturmer, 6s. to 11s.; Delicious, 9s. to 14s.; Rome Beauty, 8s. to 12s.

Southern shippers are again warned to select only best quality hard varieties of fruit for shipment to Brisbane.

Pears (Southern).

Brisbane.—Winter Cole, 12s. to 17s. per bushel; Winter Nelis, 10s. to 15s. per bushel; Broom Park, 8s. to 14s. per bushel.

All fruit should be wrapped. Unwrapped lines open up brown and specky.

OTHER FRUITS.

Strawberries.

Brisbane.—9s. to 14s. per doz. boxes. Specials to 17s. per doz.

The season for this fruit has almost drawn to a close. Berries are now showing a tendency to be soft when not sold quickly.

Cape Gooseberries.

3d. to 5d. per lb.

Packers are warned against the inclusion of green berries as these very adversely affect sales.

Tomatoes.

Brisbane.—Locals, ripe, 2s. to 8s. per half bushel; green 2s. to 6s. per half bushel; choice coloured, 4s. to 10s. per half bushel; Bowen, 2s. to 6s.; Yarwun, 2s. to 7s.

Sydney.—4s. to 8s. half bushel.

Small fruit in over-supply; second-grade lines hard of sale.

Passion Fruit.

Brisbane.—10s. to 12s. per half bushel; special grade, 14s. to 16s. per half bushel.

Sydney.—8s. to 18s. half bushel.

Melbourne.—10s. to 18s. half bushel.

Few specials higher.

MISCELLANEOUS VEGETABLES, &c.

Cucumbers.—Brisbane, 3s. to 4s. per bushel. Sydney, 3s. to 5s. Melbourne, 8s. to 10s. bushel case.

Pumpkins.—8s. to 12s. per bag. Sydney, 12s. to 16s. per bag. Melbourne, £14 to £16 per ton.

Marrows.—6d. to 1s. 3d. per doz. Sydney, 5s. to 7s. Melbourne, 6s. to 8s.

Lettuce.—6d. to 1s. doz.

Cabbage.—1s. to 2s. per doz.

Beans.—3s. to 4s. sugar bag; poor quality lower. Melbourne, 2d. to 4d. lb.

Peas.—2s. to 5s. sugar bag.

Beetroot.—2d. to 6d. per bundle.

Carrots.—2d. to 8d. bundle.

Rhubarb.—6d. to 8d. bundle.

PROTECTION OF QUEENSLAND FAUNA.

Last year the Minister for Agriculture and Stock introduced a Bill to Parliament having for its object the better protection of our fauna. Mr. Bulcock obviously has a warm place in his heart for our smaller wild animals. He has prohibited for all time the destruction of our much loved koala, and has provided machinery which should put an end to some of the objectionable methods of trapping or snaring the opossum. Provisions embodied in the Bill should end the secret slaughter and disposal of pelts, as having secured the co-operation of other States, it now will be practically impossible during a close season to dispose of such pelts either in Queensland or elsewhere. Failing the complete prohibition of the slaughter of opossums, this is the next best thing. Mr. Bulcock has certainly proved to be a humane Minister. Some day, perhaps, he will see the justification for placing the opossum in the same category as the koala.—*From the Annual Report of the Queensland Society for the Prevention of Cruelty.*

TO SUBSCRIBERS.

Subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, the Friesian Cattle Society, and the Guernsey Cattle Society, production charts for which were compiled during the month of September, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	JUNIOR, 3 YEARS (STANDARD 270 LB.).			
Valera Daphne 2nd	M. C. and A. M. Sullivan, Pittsworth	9,684·53	377·249	Blacklands Napoleon
Merridale Miss Sparrow	H. D. Giles, "Merridale," Biggenden	7,001·35	293·773	Reflection of Blacklands
Merridale Diamond	H. D. Giles, "Merridale," Biggenden	7,974	279·571	Reflection of Blacklands
	SENIOR, 2 YEARS (STANDARD 250 LB.).			
Navillus Violet 5th	C. O'Sullivan, "Navillus," Ascot	7,849·75	317·493	Parkview Mars
Jamberoo Broady II.	N. Bidstrup, Ehlma, Warra	7,646·07	312·686	Brooklyn Terrace Banker
College Rascal 6th	Queensland Agricultural High School and College, Lawes	7,904·61	307·405	Duplex of Greyleigh
Navillus Mayflower	C. O' Sullivan, Ascot, Greenmount	7,426	273·559	Parkview Mars
Navillus Viola 4th	C. O'Sullivan, Ascot, Greenmount	6,557·5	259·487	Princess Sheik of Navillus
Jamberoo Topsy 6th (258 days)	N. Bidstrup, Ehlma, Warra	6,751·66	258·323	Brooklyn Terrace Banker
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Fairvale Stately	J. H. Anderson, Southbrook	7,550·02	314·47	Blacklands Czar
Navillus Vera 7th	C. O'Sullivan, "Navillus," Ascot	8,375·25	298·675	Alfa Vale Re Nell
Navillus Daisy 5th	C. O'Sullivan, "Navillus," Ascot	7,244	276·105	Alfa Vale Re Nell
Jamberoo Reddie 4th	N. Bidstrup, Ehlma, Warra	6,512·83	248·84	Brooklyn Terrace Banker
Navillus Charm 4th	C. O'Sullivan, "Navillus," Ascot	6,423·25	243·349	Alfa Vale Re Nell

JERSEY.				
MATURE COW (STANDARD 350 LB.).				
Glenmoore Jester's Maid	G. A. Champney, Wooroolin	8,847·4	426·606	Wheatlands Jester
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Glenview Trinket	F. P. Fowler and Son, Glenview, Coalstoun Lakes	6,057·1	295·393	Trinity Governor's Hope
Oak Park Marina	Miss J. Nowlan, Lindum	6,264·4	282·223	Oakington Grassmere Plentimmon
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Glenview Royal Jubilee	F. P. Fowler and Son, Glenview, Coalstoun Lakes	6,051·8	283·659	Trinity Governor's Hope
FRIESIAN.				
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Ryfield Dairymaid 8th	P. P. Falt, Wondai	8,139	369·995	Ryfield Argus 2nd
GUERNSEY.				
SENIOR, 3 YEARS (STANDARD 270 LB.).				
Lilac Pretty Polly	W. R. Smee, Peeramon	6,811·45	298·341	Lilac Masterpiece

In Memoriam.

CUTHBERT POTTS.

The death of Mr. Cuthbert Potts, B.A., a former principal of the Queensland Agricultural College, which occurred at Brisbane on 6th October, is recorded with deep regret.

The late Mr. Potts graduated in Arts from the Sydney University in 1898, and for two years took the course for mining engineer.

Plate 206.

He subsequently engaged in dairy farming at Narellan, in New South Wales, afterwards serving a term as surveyor's field assistant. He was junior demonstrator in chemistry at Sydney University in 1901, and from 1902 to 1915 was lecturer in chemistry and physics at Hawkesbury Agricultural College, of which he was sometime Acting Principal.

Coming to Gatton in 1915 as Principal of the Queensland Agricultural College, he set about reorganising the instructional system there on modern lines and brought the college to a high standard. He had remarkable success with field crops, and was an authority on fodders. Ex-students who came under his guidance speak of him with affection and with appreciation of him as an agriculturist and of his capacity as a teacher. He retired from the Headship of the Queensland Agricultural College in 1923. In recent years he was engaged in commercial and mining pursuits.

Among his published work are several important papers on the drought problem and fodder conservation. He was a valued contributor to the *Queensland Agricultural Journal*. His "Fighting Drought, an Analysis and Some Suggestions," is regarded as a notable contribution to the agricultural literature of Queensland.

Literature was with him a leisure-hour hobby and graceful verse, which at times sparkled with gems of real poetry, a favourite method of expression.

The late Mr. Potts was greatly interested in rowing and was known on the river as a sound exponent, and many winning crews had the benefit of his coaching ability. In his student days he rowed for Sydney against the other Australian Universities.

In his last illness he displayed remarkable fortitude and courage.

On learning of his death the Minister for Agriculture and Stock (Mr. F. W. Bulcock) expressed regret at his untimely passing, and paid a tribute to his work at Gatton. Similar tributes have been paid by Professor J. K. Murray, the present Principal, and Mr. Stewart Conochie, President of the Gatton Agricultural College Old Boys' Association.

The funeral service at the Brisbane Crematorium at Mount Thompson was largely attended. The Rev. S. Atherton, of St. Thomas', Toowong, officiated, and included in the congregation were Messrs. R. Wilson, Acting Under Secretary and Director of Marketing, Department of Agriculture and Stock, who also represented the Minister, Hon. Frank W. Bulcock; Professor J. K. Murray (University of Queensland), and other members of the Staff and Senior Prefects of the Queensland Agricultural High School and College; Mr. C. J. McKeon, Director of Agriculture, and other Senior Officers of the Department of Agriculture and Stock; Mr. Stewart Conochie and many other members of the Agricultural College Old Boys' Association, and a large number of citizens representative of the professional and commercial life of Brisbane, and of numerous sporting bodies.

To the bereaved relatives, deep sympathy is extended.

General Notes

Staff Changes and Appointments.

Mr. L. G. Walker, inspector under the Stock, Slaughtering, and Dairy Produce Acts, Department of Agriculture and Stock, has been transferred from Brisbane to Longreach.

Mr. J. A. Kerr, Instructor in Agriculture, Department of Agriculture and Stock, will be transferred from Brisbane to Kingaroy.

Constable A. J. Hughes, Blackall, has been appointed also an inspector under the Slaughtering Act.

Mr. T. G. Graham, Instructor in Agriculture, Townsville, has been transferred to Ayr.

Mr. R. D. Chester, Government Veterinary Surgeon, has been transferred from Maryborough to Murgon.

Constable S. J. Rigby (Tiaro) has been appointed also an inspector under the Brands and Slaughtering Acts.

Wild Life Preservation.

Mr. J. W. Green, manager of "The Plains," Boondooma, has been appointed an honorary protector under "*The Fauna Protection Act of* 1937."

Mr. C. E. Marchant (Dart street, Auchenflower) has been appointed an honorary protector under "*The Fauna Protection Act of* 1937," and an honorary ranger under "*The Native Plants Protection Act of* 1937."

Hail Insurance Regulations Suspended.

A Regulation has been issued under the Primary Producers' Organisation and Marketing Acts providing that the Canary Seed Board Hail Insurance Scheme Regulations shall have no force or effect in respect of canary seed planted during the year 1938.

Isis Central Mill.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts empowering the Isis Central Mill Suppliers' Committee to make particular levies (2) on certain sections of growers supplying cane to the mill, each levy at the rate of one half-penny per ton of cane, and to be used for administrative purposes by the Isis and Booyal Branches Committee respectively.

The levy for the Isis Branch is payable on all cane supplied from the parishes of Gregory and Childers, County Cook, and the levy for the Booyal Branch is on all cane supplied from the parishes of Booyal and Stanton, county Cook, and consigned by Government railway trucks from Booyal, Junien, and Marule Sidings.

Growers concerned may forward a petition to the Department of Agriculture and Stock, on or before 6th September, 1938, for a ballot on the question as to whether or not the levies should be made.

Butter Board.

An Order in Council issued under the Primary Producers' Organisation and Marketing Acts amends the constitution of the Butter Board to provide that elections of growers' representatives on such board shall be held triennially in the month of December, and that such representatives shall hold office for a period of three years from 1st January next following their election.

A further Order in Council gives notice of intention to extend the operations of the Butter Board for the period from 1st January, 1939, to 31st December, 1941. A petition for a poll to decide whether or not such board shall be extended may be lodged by growers on or before the 21st November, 1938.

Cheese Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts giving notice of intention to extend the operations of the Cheese Board for the period from 1st January, 1939, to 31st December, 1941.

Growers may petition for a poll on the question of whether or not the board shall be extended for such period, such petition to be lodged at the Department of Agriculture and Stock, on or before the 21st November, 1938.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

Sensitive Plant.

F.G.L. (Mount Perry Line)—

The sensitive plant (*Mimosa pudica*) is a common tropical weed naturalised in coastal Queensland. It is particularly abundant about Mackay. It is also very abundant in Fiji, and in that country has a good reputation as a fodder. Like other leguminous plants, it has a beneficial effect on the soil, particularly if ploughed in as a green manure. We are doubtful about the plant being a success in your locality.

Plants from Goondiwindi Named.

T.D. (Goondiwindi)—

1. Cape weed, *Cryptostemma calendulacea.*
2. Oriental mustard, *Sisymbrium orientale.*
3. Pepper cress, *Lepidium ruderale.*
4. Wild tobacco or native tobacco, *Nicotiana suaveolens.*

Feeding tests have proved that ''wild tobacco'' is poisonous to stock. Reports, however, have repeatedly been received from Western Queensland that graziers have noticed sheep eating this plant to a limited extent without any ill-effects following, and some feeding tests have given negative results. This is probably explained by the fact that although Seddon and McGrath, who conducted the feeding tests in New South Wales, found that 12 oz. of the dried leaves of the plant were repeatedly poisonous to sheep, repeated small doses of less than 12 oz. were not toxic. The plant is very distasteful to stock, and generally they do not eat it in quantities sufficient to cause trouble.

5. A native indigo, *Swainsona luteola.* Feeding tests proved it to have the same effects on sheep as the common indigo or Darling pea. The symptoms are stupidity, followed by stiffness, slight staggering, and trembling of the head and limbs. Unsteadiness develops, until the animal often falls down. In this stage, the action of the animal in running over small obstacles is characteristic. It jumps over a twig as if it were a foot in height. Usually symptoms are not developed until the sheep have been feeding for several weeks in paddocks in which the plant is growing.
6. Forget-me-not, *Cynoglossum suaveolens.*
7. Vervain, *Verbena officinalis.*
8. Cud weed, *Gnaphalium japonicum.*

All of the other weeds, with the exception of Nos. 4 and 5, are not known to possess any poisonous or harmful properties, although Nos. 2 and 3 taint milk rather badly.

Without knowing something more of the facts, it would be hard to state whether No. 4 or 5 was responsible, but they are the only two in any way known to possess poisonous properties.

"Wheat Thief."

R.W.B. (Amby)—

The specimen is ''wheat thief'' or corn Gromwell, *Lithospermum arvense,* a native of Europe, now a naturalised weed in most temperate countries. We have not seen it in any very great abundance in Queensland, although every year we receive a certain number of specimens. This year, judging from the number received, it seems to be on the increase. It is a bad weed in wheatfields, and, where possible, such as in small areas, hand-pulling is the most satisfactory method of eradication. In Europe and North America, where the weed is rather a serious pest, it has been found that sulphate of iron, 2 lb. dissolved in a gallon of water, is effectual in dealing with the weed and has very little effect on the wheat.

Eulo Plants Named.

H.W.B. (Eulo)—

1. *Trachymene australis*, one of several plants known in Western Queensland as Wild Carrot. It has been accused of poisoning stock, but nothing very definite is known about it. We are doubtful about its being very poisonous.
2. Wild Tobacco—*Nicotiana suaveolens*. The wild tobacco occurs in various forms in Western Queensland and reports regarding it are very conflicting. It is generally believed to be poisonous, but at times sheep are said to eat it without any ill effects following. In feeding tests in New South Wales by Seddon and McGrath, it was found that 12 oz. or more of the plant was poisonous to sheep, but that repeated doses of less than 12 oz. were quite harmless.
3. Caustic Weed—*Euphorbia Drummondii*. This weed is regarded as poisonous, but most of the trouble is with travelling sheep. Ordinary paddock sheep very often feed on the plant with impunity. In New South Wales it contains a prussic acid-yielding glucoside, but repeated tests with the Queensland plant have always given negative results, and the symptoms are certainly not those of prussic acid poisoning. The head and neck of affected animals swell considerably and if this swelling is pierced an amber-coloured fluid exudes and the life of the sheep may be saved.
4. *Swainsona microphylla*. The properties of this plant are not known. It is a species of indigo closely allied to the well-known Darling pea or indigo. The effects of Darling pea are probably well known to you. The sheep affected have an agonised expression, the limbs become stiff, and trembling follows. Affected animals often try to jump over imaginary objects, or small objects as if they were very high. It takes fairly large quantities consumed over several weeks for animals to become affected. We have no information, however, on the plant you send.

Plants from Oakey Named.

D.S. (Oakey)—

1. Stagger weed or mint weed, *Stachys arvenis*, causes shivers or staggers in working or travelling stock. Ordinary paddock resting stock, such as dairy cattle or poddy calves, do quite well on it and suffer no ill-effects.
2. Lamb's tongue or plantain, *Plantago varia*, a useful herb in the mixed pasture.
3. The smaller burr trefoil, *Medicago minima*. See note under No. 7.
4. Pepper cress, *Lepidium ruderale*, one of the numerous plants called mustard weeds. It is a useful fodder, but taints milk badly.
5. Crane's bill or crow foot, *Erodium cygnorum*. A useful herb in the mixed pasture.
6. A native carrot, *Apium leptophyllum*, a useful herb, but taints milk badly.
7. Burr trefoil, *Medicago denticulata*, a very valuable fodder plant. In its very green state, it is apt to bloat stock, and is generally preferred when slightly wilted or drying off. The burrs which ripen in early summer or late spring cause some trouble in the belly-wool of sheep.
8. Native carrot, *Daucus brachiatus*. This plant is more closely allied to the cultivated carrot than 6.
9. Hedge mustard, *Sisymbrium officinale*, a common farm weed, taints milk if eaten in any quantity.
10. Marshmallow, *Malva parviflora*, a very common farm weed in Queensland, particularly on the Darling Downs. In New South Wales it has been accused of causing shivers or staggers in sheep. We have had no trouble with it so far as we know in Queensland.
11. *Erodium cygnorum*—No. 5.
12. Shepherd's purse, *Capsella bursa-pastoris*, taints milk badly if eaten in quantity.
13. *Helipterum polyphyllum*, a very common native plant for which we have heard no common name. It belongs to the Everlasting family.
14. Cudweed, *Gnaphalium purpureum*, a common farm weed. If eaten in any quantity, it is sometimes stated to cause impaction in stock.

Cooyar Plants Named.

B. McG. (Cooyar.)—

1. *Vittadinia triloba*, a common weed on the Downs for which we have not heard a local name other than "ragweed," a name applied to a number of weeds in Queensland.
2. *Solanum* sp., a potato bush. The green berries are thought to be harmful to stock, but we have little definite information on this point.
3. *Geranium dissectum*, crow-foot, also called wild carrot, although we have a true carrot on the Darling Downs. It is excellent feed for stock, particularly sheep.
4. Knot grass or Knot weed—*Polygonum aviculare*—a very common weed of cultivation during winter and spring. It is not known to possess any poisonous or harmful properties, but the long fibrous stems are said to cause impaction in stock.
5. *Rumex* sp., a dock. The docks are often troublesome weeds in cultivation.
6. Button Mallow—*Modiola multifida*—a native of North America, now a naturalised weed in many parts of the world.
7. Cudweed—*Gnaphalium purpureum.*
8. Pepper Cress—*Lepidium ruderale*—one of several weeds in Queensland called mustard weed or turnip weed. It is quite a good fodder, but taints milk rather badly.
9. Mouse-ear Chickweed—*Cerastium vulgatum*—a weed with a very wide distribution over the temperate parts of the world. It is fairly common in Queensland during the winter and spring months.
10. Bachelor's Buttons—*Craspedia uniflora.*

Plants from Redland Bay Named.

P.W. (Victoria Point)—

1. Shepherd's Purse—*Capsella bursa-pastoris*, a weed spread widely over the temperate regions of the world. It is quite a good fodder, but taints milk rather badly.
2. Mat Rush—*Xerotes multiflora.*
3. Chickweed—*Stellaria media*, a common weed spread widely over the temperate regions of the world. It is abundant in Queensland and rather a pest of cultivation during winter and early spring.
4. Fumitory—*Fumaria parviflora.*
5. Yellow Weed—*Galisoga parviflora*, generally regarded as a good fodder for stock.
6. Stagger Weed—*Stachys arvensis;* also called mintweed or wild mint, but not to be confused with the poisonous wild mint of the Darling Downs. It causes staggers or shivers in travelling stock. They recover, however, when put on to ordinary feed.
7. Pimpernel—*Anagallis arvensis*, a common weed spread widely over the temperate regions of the world. It has been accused of poisoning stock both in Australia and abroad. It has rather an objectionable taste, however, and is not often eaten in sufficient quantities to cause trouble.
8. Rib Grass—*Plantago lanceolata.* This plant is sometimes grown as a fodder. It is moderately common as a weed in Queensland and we cannot say that we have seen stock take to it very readily.
9. St. John's Wort—*Hypericum gramineum.*

Native Onion.

S.W.L. (Dalby)—

The specimen from Kaimkillenbun is the native onion, *Bulbine bulbosa.* This plant has been suspected in both Queensland and New South Wales of poisoning stock. Bailey and Gordon reported the plant as having caused the death of travelling rams, and quoted W. R. Hutchinson that sheep and horses when affected lie down, roll about, scour badly, and discharge mucous matter yellow in colour from the nose.

The plant, so far, has been tested only on a limited scale by feeding, but was not found to be poisonous. This point is being further investigated.

Rural Topics

Pasteurised Silage.

In England, grass cuttings from aerodromes are now turned into silage, which is said to keep fresh and green for as long as three weeks after it comes out of the silo.

The grass, before it goes into the silo, is passed through a hot water bath at a temperature of about 180 degrees. This has the effect of pasteurising it; that is, killing all the organisms, like bacteria, that might be present on the grass. No fermentation can then occur in the silo, so that there should be no loss in either the quantity or quality of the material put in.

The process is said to be cheap. The selling price of the silage is about £1 15s. a ton out of the silo. The quality is said to be good, some of the silage having as much as 20 per cent. protein in it, and this about the equivalent of a fairly rich concentrate.

Windmills for Electric Light on the Farm.

The wind is one of the first sources of power to be used by man, and the possibility of its additional uses is still a subject in which all are interested. The idea of "free power" (like free drinks) is attractive, and so it is difficult to appreciate that the biggest limitation to its use is not technical, but economic. It is natural to think of wind power for generating electricity, but the cost is the bugbear. In England, however, the question of reducing costs—overhead is the chief one—is being investigated thoroughly. In Germany and Russia the installation of large electricity generating plants operated by wind power has already been planned.

Competition of Margarine.

There is something like a warning in these remarks of the *London Grocer*:—"An immediate result of the recent high prices of butter is the increase of 20 per cent. in the output of margarine during the four weeks ended 28th May. The figures for May are the highest this year, but it will be interesting to see how the June average works out now that butter prices (that is, London butter prices) are many shillings lower. There is, however, no doubt that retailers will be hard put to it to recover the butter trade which they have lost to margarine."

A Quick Business Trip.

The chairman of directors of a London butter firm, being desirous of opening business negotiations with the Australian Dairy Produce Board, came direct to Australia by air for the sole purpose of attending the annual meeting of the board which was held recently. He was welcomed by the chairman (Mr. T. M. Plunkett, M.L.A., of Beaudesert, Queensland) and, having stated his business and received the assurance that his proposal would be considered at the proper time, left the meeting to drive to the aerodrome for the return flight to London.

Dairy Instruction in New Zealand.

Farm dairy instruction on a national scale was brought into operation in New Zealand with the start of the present season. Sixty per cent. of the cost will be borne by the industry and 40 per cent. by the Government. The Dominion has been mapped out into seventy-seven districts, each of which will be served by a farm instructor working under the control of the dairy instructor of the particular district.

Australian Wheat-sowing Record.

Here is a record that will interest farmers on the Downs:—A Victorian farmer has sown 920 acres in 144 continuous hours, with fifteen hours of service, making the actual time 129 hours. Four men worked sixteen shifts night and day on one tractor and a 24-run combine at between 7½ and 8 miles an hour. It was the first high-speed tractor put into private use in the Commonwealth. The usual speed of tractors is from 4 to 5 miles an hour, and of horse teams from 2½ to 3 miles an hour. The usual sowing rate for tractors is 50 acres a day and 100 acres in twenty-four hours. Although the area was littered with mallee stumps, there was no damage to implements.

The Deadly Pea Rifle.

From the annual report of the Queensland Society for Prevention of Cruelty:—

In our last annual report we referred to the loss of life or injury to so many youths due to the pea rifle. We feel very strongly on this matter, and again this year we wish to draw attention to the tragedy which the pea rifle leaves in its wake. Since our last report we have noted twenty-eight cases reported in the daily Press of such tragedies, some being from other States. Here are brief references to a few of them:—

> In a Brisbane suburb, a youth was cleaning a pea rifle, when it exploded, the bullet entering his temple and causing his death.
>
> Youth of seventeen accidentally shot at Sandgate with a pea rifle.
>
> Lad of sixteen accidentally shot with a pea rifle. Removed to hospital.
>
> Lad of thirteen handling a pea rifle when it discharged accidentally, the bullet entering his body. Removed to hospital where he died.
>
> Lad of thirteen standing by his brother, who was milking a cow, when another lad shot at some birds in a hedge. The bullet entered the thirteen-year-old lad's head and killed him.
>
> Following the accidental discharge of a pea rifle, a lad of twelve years was conveyed to hospital in a serious condition.
>
> Youth of seventeen out bird shooting. Put down his pea rifle whilst crossing a stream and asked another boy to throw the gun to him. In doing so, the rifle went off and killed him.
>
> Youth aged seventeen shot and maimed a kookaburra (which is against the law). He was about to kill it when another kookaburra, probably its mate, flew by, and in swinging the weapon into line to shoot the second bird, it went off and fatally shot a young woman twenty years of age.

Schoolboys and young lads when intercepted using a pea rifle often give the answer that they "are only shooting sparrows, they are a pest and eat the seeds." We publish here an article which appeared in the *Graziers' Journal* recently, and which was written by an authority on such matters:—

"Spare the Birds that Eat the Insects.

"Air-guns in the hands of small boys, and sometimes in those of adults, who should know better, counteract the decrease of noxious insects. For it is the mossie, a preyer upon insects, which is usually the victim of human bloodthirstiness. There are other useful small birds, too, which are continually, all the year round, being killed 'for fun' . . . . Sparrows feed on grain, of course, if it is small, but they do more good than harm. . . . . Observe the sparrow and see what he does. He is continually flitting about after insects on the ground or in trees. If he pecks at a tomato or a peach he is trying to get a worm out. See what sparrows feed their nestlings—never grain, always caterpillars, moths, and flies. The green and black aphis lice which shrivel up the rose trees and appear to be fond of peach and plum leaves, and kill the buds, are the sparrows especial tit-bits. If there are no worms in your peaches or tomatoes, the sparrow will not damage them. . . . . "

Injuries to water fowl are also included amongst raids by lads. One instance was where a young duck was endeavouring to swim in amongst the reeds for protection, but made no progress, as it kept swimming in a circle; it was found that one of its legs had been shot away.

As schoolboys during school holidays are mainly responsible for the harm done to our birds, it may do a great deal of good if the teachers were to speak on the subject before the breaking-up for the holidays. . . . One of the world's great authorities on the subject has said that no system of education is complete unless the child is instructed on the principles of kindness to all created things, and that cruelty to animals will continue until the younger generation are shown what a cowardly and shameful thing it is.

Pigs Need Exercise.

Pigs kept continuously in sties or small runs spend most of their time sleeping or trying to get out of the enclosures. They are not given any chance of getting natural exercise, and when they go to the curer or pork butcher they fail to measure up to the full requirements of their class. Feeding and farm organisation may be perfect; large litter weights and early maturity may be the watchwords of management; and careful selection of breeding stock may be all that is desirable; but if the pigs have been denied opportunities for plenty of natural exercise they will be found to be unbalanced in fat and lean when they are cut up. Breeding, feeding, and open-air management are fundamentals in successful pig farming.

"Bull-dogging" Cattle at Shows.

Comment from the annual report of the Queensland Society for the Prevention of Cruelty:—

The reason put forward to justify bull-dogging at our Royal National Show is that it demonstrates to city people the methods used on cattle stations, whereas it really does not represent anything of the sort. As a matter of fact, it is not done on cattle stations to-day. The president of the Royal National Association is a cattleman of wide experience, interested in cattle all his life, and we venture the opinion that he has never seen, authorised, or permitted bull-dogging on any of his properties, and that he is well aware that it is not a practice on cattle stations. Then why represent it as such at our annual exhibition? Apart from other objectionable features of bull-dogging here are some pertinent Press comments on the subject under the heading of "Rodeo Economics":—

> "The Queensland Meat Board has not entered the controversy over steer-throwing and bull-dogging in which those who say it is cruel and unnecessary have scored most points, but we imagine its sympathy is with those who are endeavouring to eliminate this wild west touch from our Exhibition."

The latest reports from Smithfield Markets state that there is a great monetary advantage in the careful handling of cattle and that Queensland cattlemen must get it out of their heads that they are running a rodeo if they want to compete with the Argentine on the world's meat markets.

What is a Scrubber Cow?

The practice of herd-testing has been of inestimable service in New Zealand. The wonder is that it is not more universally employed. It so readily exposes those cows that cost money to keep. Perhaps the standard that would mark the scrubber cow may vary from district to district, but a safe line would perhaps be to judge one's own herd by the average production of the cows in one's immediate territory, and then to work up from that point. In the Temuka district 852 cows were in milk for 100 days or over. Of that number 211 found themselves in the class that produced between 250 and 299 lb. butterfat; 167 cows made between 200 to 249 lb. fat. Below that, one comes to the "suspect" class pretty quickly—90 were between 150 and 199 lb. fat; 41 were between 100 and 149 lb.; and 11 between 50 and 99 lb. That there is a good field for up-grading in South Canterbury is shown by the fact that 177 cows made between 300 and 349 lb. fat (this is where the real profit begins!); 93 produced between 350 and 399 lb.; 40 set a nice high standard in a class between 400 and 499 lb. fat; 16 did between 450 and 499 lb.; 5 excelled with between 500 and 549 lb.; whilst one put herself in a class by herself with 635 lb. fat—a fine record under herd conditions. If dairy farmers took the trouble to study the striking differences in the performances of the cows that are tested in their respective districts, and allowed their future policy to be guided by the lessons that the figures teach, progress towards the elimination of the unprofitable scrubber cow would be much more rapid that it is at present.—*The New Zealand Farmer.*

The Dairy Farm.

Large paddocks on a dairy farm are not economical. If practicable, the farm should be subdivided into a number of small paddocks, which allows for each to be grazed in turn, and then spelled for a period to enable the paddock to recover. Large paddocks often mean fodder wastage, as cattle roam all over the area, eating out the choice grasses and fouling the remainder, making them unfit for food.

A lot of waste results from faulty management of good pastures by stocking too heavily, which means, of course, that good grasses are eaten up quickly. If the paddock is spelled for a reasonable period, the pasture gets a chance to recover and the grasses have time to seed.

Unwise feeding methods constitute a prolific source of waste. It is necessary to balance the ration so that there will be no waste or loss in production through feeding an excess of one food constituent at the expense of another.

Free Milk for School Children.

Latest returns from the primary schools in England and Wales shows an appreciable increase in the number and percentage of children taking milk and in the number of schools operating the scheme. If parents cannot afford the penny, the milk is distributed free. The number of children receiving free milk is approaching 200,000.

An Electric Stock Fence.

The latest idea in fencing is a single wire charged with electricity. Mr. R. G. Watson is, it is believed, the first Queenslander to use electricity to keep pigs from getting out of bounds. Recently he installed an electric stock fence on his Beaudesert buttermilk piggery.

The outfit consists principally of a 6-volt battery, a transformer, and a spring-balanced flywheel which makes a regular break in the flow of current in the wires. The fence is actually a line of light stakes to which the wire is attached—with insulators, of course.

In applying the idea, Mr. Watson erected a light fence of wooden stakes across a plot of sweet potatoes with two lines of light fencing wire attached. As a try-out, about 60 small pigs were driven on to the potato patch. As soon as they spread out and contacted with the charged wires, the mild shocks received turned them back and nothing would induce the pigs to repeat the experience. Afterwards, a fence was erected along a seven-chain strip of sweet potatoes, making a narrow paddock 5 yards wide. When the pigs were driven on to this area, it was observed that those which had made contact with the wire previously kept well away from it. Within a few minutes not one of them attempted to break through the low light fence. After four days on this small area the pigs had eaten out all potatoes and other growth, leaving the whole of the narrow paddock bare to within a foot of the electrified fence. Hungry as they became, they would not eat down the feed which was close to the fence.

Already the idea of an electrically-charged stock fence has been adopted on some dairy farms in New South Wales, where cattle are kept within bounds by a single-charged wire. One shock is enough to make the cattle canny, and thereafter they keep well away.

It is claimed for the electric fence that it is cheap, easy to erect, dismantle and re-erect, and that there is no doubt about its effectiveness.

—*T. Abell.*

The Pig on the Dairy Farm.

Pig raising is an occupation with no appreciable peak load of work to clash with other jobs in dairy farming, and the by-products—skim milk, buttermilk, or whey—are converted readily into cheap and appetising pork.

On practically every dairy farm in Queensland, pigs have been and always will be a valuable side-line. Too often the pig has been regarded as merely necessary to consume milk or whey that would otherwise be wasted.

Pigs, properly housed and fed, may even rival the cows themselves as money makers.

The open-air or pasturage system, under which pigs are allowed to graze at will in a good, well-grassed paddock, enables the dairy farmer to get the full benefit of his by-products. Where crops and pasturage are available, the young pigs can be reared chiefly on those feeds—the skim milk being reserved largely for the older pigs being topped off in the sty. The young pigs will, of course, go through the topping-off process in their turn.

Cheap and effective shelter can be provided in the pig paddocks. A small shelter can be quickly knocked together by any handy man. It should be strong and easily movable (on skids for preference); and, of course, should be rain, wind, and draught proof.

No Show Umpires.

There are no umpires at Danish agricultural shows. The Danes glory in plural judging. The minimum bench comprises three judges, and there are often five judges working together. If this plural bench of judges is divided among individual entries or groups, they must give all the equal rivals an equal award of prizes—two or three firsts, as circumstances warrant, and so on.

School Children and "Grass Consciousness."

The Queensland Pasture Improvement Committee is very pleased with the report from the Department of Public Instruction on the work carried out by pupils of the State schools. Although dry weather had adversely affected the number of schools doing this project work, the interest displayed by the youngsters has been maintained at a high pitch. Last year more than 5,000 packets of grass seed were distributed and sown. The list of successful competitors covers practically all portions of the State.

Orchard Notes

DECEMBER.

THE COASTAL DISTRICTS.

THE planting of pineapples and bananas may be continued, taking care that the ground is properly prepared and suckers carefully selected, as advised previously in these Notes. Keep the plantations well worked and free from weeds of all kinds, especially if the season is dry. New plantations require constant attention, in order to give young plants every chance to get a good start; if checked when young, they take a long time to pull up and the fruiting period is considerably retarded.

Citrus orchards require constant attention; the land must be kept well worked and all weed growth destroyed. Spraying for scale insects should be carried out where necessary.

Early grapes will be ready for cutting. Handle carefully, and get them on to the market in the best possible condition. A bunch with the bloom on and every berry perfect will always look and sell well, even on a full market, when crushed and ill-packed lines are hard to sell.

Peaches, plums, papaws, and lemons will be in season during the month.

Examine potatoes and tomatoes for Irish blight, and melons and kindred plants for downy and powdery mildew. Use Bordeaux or Burgundy mixture for Irish blight and downy mildew, and sulphur dust or lime sulphur spray for powdery mildew.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

EARLY-ripening apples, plums, apricots, peaches, and nectarines will be ready for marketing during the month. They are unsatisfactory lines to handle. The season of any particular variety is so short that it must be marketed and consumed as quickly as possible. All early-ripening deciduous fruits are poor carriers and bad keepers, as their flesh is soft and watery, deficient in firmness and sugar, and cannot, therefore, be sent to any distant market. Early-ripening fruits should, therefore, be carefully graded for size and quality, handled and packed with great care, and nothing but choice fruit sent to market.

Orchards and vineyards should be kept in a state of perfect tilth, especially if the weather is dry, so as to retain the moisture necessary for the development of the later-ripening fruits. Where citrus fruits are grown, an irrigation should be given during the month if water is available for this purpose, excepting, of course, there is a good fall of rain sufficient to provide an ample supply of moisture.

Codling moth and fruit-fly regulations should be observed in order to keep these pests under control; otherwise the later-ripening fruits are likely to be attacked severely by these pests.

THE COUNTRY PRESS—ITS VALUE.

"I believe every country district should have its own local paper," said the Governor (Sir Leslie Wilson), when opening the thirty-first annual conference of the Queensland Country Press Association.

"I have a great admiration for the Press," continued His Excellency. "In my life I have come in very close touch with it. Sometimes, in England, it was a little critical, but relations in the colonies have been entirely cordial. Nobody recognises the power of the Press more than I do."

In these days when aeroplanes and other means of transport were bringing Australia in close touch with the people of Europe, it was necessary that country people, as well as those in the city, should be supplied with accurate information of Imperial as well as local affairs, said Sir Leslie. Members of the Country Press Association were performing a great service. The association had been in existence for more than thirty years and had a membership of seventy.

There was one British paper—"The Times"—which had, perhaps, the best reputation of all newspapers. It represented the views of the whole Empire accurately, and its articles were reported in other papers throughout the world.

Farm Notes

DECEMBER.

EARLY-sown crops of sweet sorghums, Sudan grass, millet, and maize, intended for fodder purposes, will now be in an advanced stage of growth, and where pastures are in fair condition there may be a surplus over immediate requirements. Every effort should therefore be made to conserve any surplus growth in the form of silage, hay, or stover.

Trench, pit, or stack silage can be recommended as economical and profitable means of conservation where the farmer does not possess an overhead concrete silo.

However, it is the autumn-harvested crops which usually provide the greatest bulk of conserved fodder, so that December sowings of suitable bulky summer fodder crops will prove ideal for that purpose.

In localities where lucerne does not make satisfactory growth, the cowpea will often provide an alternative protein-rich fodder, besides being a valuable rotation crop of benefit to the soil. Cattle will not take readily to green cowpea, preferring the fodder in an advanced stage of growth, but once accustomed thereto, will be found to graze freely.

Sowings of main crop maize will be continued during the month where conditions are suitable, utilising late-maturing varieties such as Improved Yellow Dent, but in districts where early frosts are experienced the mid-season or early varieties are to be preferred.

Buckwheat can be recommended as an early-maturing alternative fodder crop, or as green manure where it is desired to plough under within 6-8 weeks. Besides being a good fodder, buckwheat is valued as a bee plant, while the seed makes excellent poultry feed. Wheat-harvesting will be practically finalised during the month. Growers are therefore advised to give the land a preliminary working immediately after the burning or grazing of stubble, in order to conserve succeeding summer rains to the fullest extent.

Even where the land is too hard for adequate ploughing, a light working with disc cultivation or Sundercut will be found very beneficial.

The comparatively dry wheat seasons experienced during recent years have proved that adequately summer-fallowed land invariably produces profitable yields.

December is usually a busy month, through the successive sowing of a variety of fodder and grain crops, together with the scarifying of row crops already established.

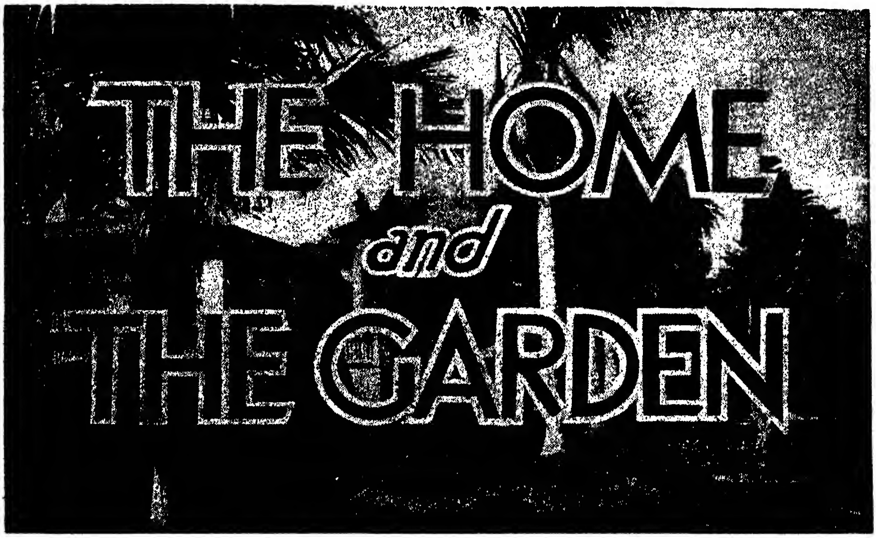
SOME FACTORS IN DAIRY FARM MANAGEMENT.

There are certain essential factors in dairy farm management that make all the difference between success and failure. Although milking may be regarded as the main job on a modern dairying property, it is really the culmination of herd management, breeding, feeding, and attention to detail.

Why is it that on two identical farms, with only a boundary fence between them, production will show a vast variation? The answer is found in the fact that on one property constant attention is given to all the operations—from calf-rearing to the final disposal of the milk or cream—while on the other farm careless or bad management in one or two operations mars the whole effort.

It is useless to lay down good pastures and provide food, shade, shelter, and water for stock, and then keep on breeding from low-type producers.

Another important matter which should not be overlooked is the fact that modern intensive methods of dairy farming place a very high strain on the constitution of the dairy cow, and much of this constitution may be ruined by faulty methods in calf-rearing. From a practical viewpoint it is better to feed the breed than to feed the weed.



Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

DIARRHŒA.

IT is not many years since diarrhœa was the most frequent cause of death amongst infants. In recent years there has been a large diminution in the incidence of the disease and a great reduction in the number of deaths from this cause. Diarrhœa tends to occur during the summer months, partly because milk decomposes more rapidly during hot weather, but chiefly because milk becomes infected by disease-producing germs which are conveyed by flies during this season of the year. It is only by an intelligent use of our knowledge of the cause and spread of a disease that we can do anything to prevent it.

By diarrhœa is meant the passage of frequent, loose or watery motions. It is often caused by the presence of some irritating material in the bowel. It is due to Nature's effort to expel this that the motions become frequent. It is important to remember that the motions of breast-fed infants are never firm and solid like those of artificially fed infants. A breast-fed infant in normal health may have two or three soft motions a day. A change in the colour of the motion to a pale yellow may be the first sign of digestive upset. The passage of two or three loose motions in an artificially fed infant, particularly if they are pale or green, calls for attention. According to their cause diarrhœas may be divided into two kinds—

1. Non-infectious diarrhœa.
2. Infectious diarrhœa.

1. *Non-infectious Diarrhœa.*—This may be caused by simple over-feeding with food which is quite suitable when not given in excess. Diarrhœa due to this cause may occur at any time of the year, but it is more likely to occur in summer when babies, like older people, are more thirsty. Mothers often fail to distinguish between hunger and thirst in their babies. Thirst is satisfied by plain boiled water, of which every baby should receive a sufficient amount between his feeds. If a baby is given milk every time he is thirsty, his digestion will be upset, because milk is a food and he will be induced by his thirst to take more than he is able to digest. There are strong, vigorous, greedy babies who habitually take more than they can digest and you will be able to observe numerous large curds in their motions. Sooner or later many of these babies suffer from digestive upset, if they are allowed to continue over-feeding.

Unsuitable foods may cause diarrhœa. These are of so many kinds that it would be difficult to enumerate all of them here. Some of these are given because the mother knows no better, and in other cases, because the mother finds it easier to give the food than have the child emotionally upset by her refusing it. During the crawling stage and later many children discover for themselves and eat food of an unsuitable nature.

Treatment of Non-infectious Diarrhœa.

Diarrhœa occurring in a breast-fed baby is as a rule never as serious as diarrhœa in an artificially fed baby. When it occurs it is usually wise to give a teaspoonful of castor oil at the beginning, in order to assist Nature in expelling any irritating material which may be present in the bowel. Omit one or two breast feeds or more, depending upon the severity of the condition and the manner in which the infant responds. During this time allow him as much boiled water as he will take. On resuming breast feeding commence with short feeds, giving boiled water before each feed until an improvement is noticed in the character of the motions.

In the case of the artificially fed infant suffering from diarrhœa, all food is stopped, a dose of castor oil is given, and he is encouraged to take boiled water freely. After a few hours he is allowed as much sweetened barley water as he will take. Dried apple powder mixed with water and later with whey is found useful, particularly in the more severe cases. As the condition improves milk may be gradually added to this mixture until he is well enough to be placed on a milk mixture suitable for his age. Children who were having cereal jellies, vegetable broth and vegetable puree previous to the onset of the diarrhœa are allowed these before the milk is added.

2. *Infectious Diarrhœa.*—This is a much more serious condition which is caused by the infant or older child swallowing disease-producing germs which were present in the milk or other food which he has taken. In some cases the illness begins suddenly with high fever and vomiting, the child becoming drowsy and limp. In other cases the illness begins more gradually and the seriousness of the condition is not at first recognised. The motions are frequent and may be large, green, watery, slimy, and offensive, or they may be frequent and small containing blood and slime and having a "stale" odour. The passage of the motions may be accompanied by considerable straining and pain.

Treatment of Infectious Diarrhœa.

In every case of diarrhœa in which the child looks ill and particularly if he is feverish, or is passing blood and slime, or in which the condition has been treated by the methods recommended in the treatment of non-infectious diarrhœa and no improvement has occurred within twelve to twenty-four hours, medical advice should be sought immediately.

The Prevention of Diarrhœa.

The responsibility for the prevention of diarrhœa rests with the mother or person in charge of the feeding of the infant. Breast-fed infants have an infinitely better chance of escaping an infectious form of diarrhœa than artificially fed. As has been pointed out, they may suffer from food diarrhœa as the result of over-feeding, or of swallowing some unsuitable food. It is inadvisable to begin weaning during a spell of very hot weather. Never try to force a child to take his food, particularly during the heat, when he requires less. Secure clean and safe milk for the artificially fed infant as well as the older child. All milk should be scalded unless it can be obtained pasteurised in sealed bottles. After scalding it should be cooled rapidly, and kept cool. Scalded and pasteurised milk, as well as powdered milk mixtures, may become contaminated. In order to avoid this, care must be taken to protect them from flies, dust, and dirty fingers, and to see that teats, bottles, and other utensils are thoroughly washed and scalded immediately after use. Milk which is sweet may contain disease-producing germs. Diarrhœa may be caused by the use of stale milk. Avoid sudden changes in the quantity, quality, or composition of milk foods. If a change is necessary, make it gradually by grading baby on to the new mixture.

You may obtain information on all matters concerning child welfare by visiting the nearest baby clinic, or by writing to the sister in charge, or by communicating direct with the Baby Clinic Training Centre, Alfred street, Valley, Brisbane.

DIET PLANS REVIEWED.

(Contributed by the Queensland Nutrition Council.)

These diet plans are by no means an attempt to lay down economic standards but are merely a practical illustration of how best to secure a good nutritive value at different levels of food expenditure. They are based on intensive research carried out by nutrition scientists in America and published by the United States Department of Agriculture. The figures have been slightly modified to suit Australian conditions.

Each of the plans was based on the following twelve groups of foods:—

1. Milk in all its forms.
2. Tomatoes and citrus fruits.
3. Potatoes.
4. Green leafy and yellow vegetables.
5. Dried beans, peas and nuts.
6. Dried fruits.
7. Other vegetables and fruits.
8. Eggs.
9. Lean meat, fish and poultry.

10. Flour, bread and cereals.
11. Fatty foods, such as butter, lard, bacon.
12. Sweet foods, such as sugar, honey, jam, syrup.

In each diet, these foods were apportioned differently, nutritive value and cost being taken into consideration. In every plan, however, special emphasis was placed on milk, fruit and vegetables. In all cases, at least one-fifth of the money spent on food was used for purchasing milk. In the moderate cost diet, cereals to some extent replace the vegetables, fruit and meat, and this change is even more marked in the minimum cost and restricted diets. But even here enough vegetables, fruit, eggs, and lean meat are allowed to supply vitamins, minerals, and protein not adequately furnished by bread and by milk. The restricted diet however, is not meant to be used over an indefinite period as it does not provide sufficient quantities of the foundation foods to ensure good health over a long period.

In the low cost plans it is essential that wheatgerm or whole meal cereal and bread be used, as there is not a sufficient quantity of vegetables to supply vitamin B without it. Though the quantity of milk is somewhat lower than in the other plans, milk and cereal products together are the mainstay of these cheaper diets, because they give more nutritive value in return for the money spent than do most other foods. Enough fats and sugar are added to round out the fuel value.

The differences between the various plans show most clearly when the weekly food supplies for a definite-sized family are compared. For instance, a family of four on the liberal diet buy nearly twice as many pounds of fruit and vegetables, about two and a-half times as much lean meat and nearly twice as many eggs as the same sized family on a minimum cost adequate diet. There is a marked difference, too, in the individual foods that can be selected for each of these diets, since this choice depends largely on the total amount of money available for food. Quality, the kind of food and the season of the year influence the cost of many individual items.

It is not necessary or likely that the housewife will weigh out a supply of food exactly representing one of these diet plans week after week. However, if you wish to secure the greatest return in nutritive value for the money spent you will find it helpful to follow one of the plans for two or three weeks, making careful notes of food weights and costs. This will be especially valuable if you have only a limited amount of money to spend on food. It does not take long to get the patterns of the diet well in mind and then to make purchases that run pretty close to one or another of the plans, without continuing to keep an accurate record.

The individual housewife will undoubtedly make changes to meet the tastes and food budget of her family. Such changes always mean decreasing the quantities of some foods by increasing the amount of cereals and decreasing somewhat the quantities of some of the other foods.

A minimum-cost diet should be modified only to improve it. If the pocket allows, the food value and flavour of the suggested assortment of foods may be improved by increasing the fresh fruits and vegetables. The moderate cost plan may be the guide for such changes. The family which can barely afford an adequate diet by making food money go as far as possible should not try to adjust the assortment of foods in the

minimum cost diet. The relation of food value to food cost is so close that the easiest way to get a cheaper diet that is satisfactory (at least for a time) is to resort to the restricted plan.

Any modifications in a restricted diet should be those that will improve its nutritive value. Families who, because of some emergency, are living on a diet such as the restricted plan suggests, should look forward to increasing, as soon as possible, quantities of fresh succulent vegetables, fruit, milk, eggs, and lean meat. These changes will, of course, increase the cost. They should be made by reducing some foods and increasing the quantities of others, in order to keep the fuel value in the diet fairly consistent. Decreasing one type of food does not necessarily mean that it is less wholesome than the other foods. It simply means that some foods supply nutriment more cheaply than others, or that some are more pleasing to the individual family.

The family purchasing a diet as expensive as the liberal diet has the best choice among foods. It may modify the plan in many ways; for example, by using fewer pounds of potatoes and dried fruits, and adding more fresh vegetables and fruits. This will increase the cost. Some families may wish to use more cereals and bread, and will, in that case, probably decrease the amount of fruit, vegetables, and meat, using the moderate-cost plan as a guide.

The suggestions for a moderate cost adequate diet may also be modified up or down the scale, according to the amount of money a family has to spend on food. Increasing vegetables, fruit, eggs, and meat towards the quantities suggested for the liberal diet tends to improve protein, mineral, and vitamin values, but also brings up the cost. A diet of this type can, on the other hand, be brought down in studying the plan for the minimum cost adequate diet.

If any readers would like to work out the cost for a week of the diet that suits their particular needs, the Nutrition Council would be interested in their findings. Send them to the secretary of the Nutrition Council, Physiology School, University of Queensland, for the information of the Economic Subcommittee of the council.

Those who have read Milton's "Paradise Lost" may remember this passage, which is as true to-day as when it was first written—

"If thou wilt observe
The rule of not too much, by temp'rance taught,
In what thou eat'st and drink'st, seeking from thence
Due nourishment, not gluttonous delight,
Till many years over thy head return,
So may'st thou live till like ripe fruit thou drop
Into thy mother's lap, or be with ease
Gathered, not harshly pluck'd, for death mature."

IN THE FARM KITCHEN.

BANANAS ON THE MENU.

Banana and Cheese Savoury.

Take 3 bananas, 1 tablespoonful capers, ¼ lb. cheese, 6 fingers brown bread and butter, anchovy paste.

Spread the fingers of bread with anchovy paste. Cut the cheese into thin fingers and place one on each finger of bread. Skin the bananas and cut them in half lengthways. Put a banana flat side down on each piece of cheese, and decorate it down the centre with a row of capers. Arrange star shape on a plate. Garnish with parsley.

Banana Cheese Salad.

Take 4 bananas, 1 egg, 1 or 2 apples, 2 tomatoes, 2 oz. cheese, lemon juice.

Boil the egg for fifteen minutes until hard, then cut into slices. Peel and quarter the apple, remove the core, and cut into slices. Grate the cheese finely, slice the tomatoes, peel and slice the bananas. Arrange all these prepared slices tastefully in a dish, sprinkle with lemon juice and a little grated cheese, pile the remainder of the cheese in the centre, and serve with salad cream.

Banana Toast.

Take ¾ gill banana pulp, 5 oz. cheese, 3 oz. butter, 1 egg-yolk, 6 or 7 rounds bread, chopped parsley, seasoning to taste.

Toast the bread, then spread with butter and keep hot. Grate the cheese finely. Peel and mash up sufficient bananas to make the pulp. Melt 1 oz. of butter in a saucepan, add the grated cheese and banana pulp, and stir over a low heat until creamy. Draw aside, stir in the egg-yolk, and cook gently for a few minutes, then season with pepper, salt, and mixed mustard. Spread on the prepared toast and garnish with finely-chopped parsley.

Banana Savoury.

Take 3 bananas, 6 finger slices of bread, 1 small cream cheese, 1 hard-boiled egg-yolk, lemon juice, seasoning, fat for frying.

Split the bananas into halves and cut a small piece off the end of each half. Cut slices of bread the same length as the prepared bananas and fry in deep fat until golden brown. Then drain on paper. Spread a thick layer of cream cheese on the fried bread and season with pepper. Place a piece of banana on each, sprinkle with lemon juice and pepper, and garnish with powdered egg-yolk.

To powder the egg-yolk, just rub it through a wire sieve or strainer.

Curried Bananas.

Take 4 bananas, 3 oz. rice, ½ oz. butter, ½ oz. flour, ½ apple, ½ onion, 1 teaspoonful salt, 1 desertspoonful curry-powder, 1½ gills water, juice ½ lemon, 2 hard-boiled eggs.

Wash the rice and boil it for fifteen minutes with the salt in plenty of fast-boiling water. Boil the eggs for ten minutes, put them in cold water, and remove the shells. To make the curry sauce, peel and chop the apple and onion, and fry them in the butter for five minutes. Stir in the flour, curry-powder, lemon juice, and a pinch of salt, and add the water gradually. Stir the sauce till it boils, lay the skinned bananas in the sauce, and beat them for about five minutes. Add a little more water if necessary. Strain the rice into a colander and grate a little onion on to it. Do not mash the rice. If it is boiled for exactly the right time each grain will be separate. Heap the rice on a hot dish with the bananas and sauce round and garnish with quarters of hard-boiled egg.

Banana and Pineapple Royal.

Take 7 bananas, ½ pint milk, ½ oz. gelatine, 1 small tin pineapple.

Peel six of the bananas and mash them to a pulp. Drain the syrup from the pineapple and put the fruit through a mincer. Dissolve the gelatine in a saucepan with half a gill of the pineapple juice, add the remainder to the banana pulp. Stir in also the minced pineapple, leaving out a little for decoration. Strain in the dissolved gelatine, then add the milk, and some castor sugar if required. Turn into a dish and leave to set. Just before you are ready to serve it, heap some minced pineapple in the centre and add the remaining banana cut in slices.

Ginger Bananas.

Take 6 bananas, 1 gill cream, 3 oz. preserved ginger, apricot jam, a few almonds, castor sugar, vanilla.

Blanch and chop some almonds. Place them on a sheet of paper on a tin, and put into the oven until a golden brown. Peel the bananas and split into halves lengthways, then scoop out a little ridge down the centre. Cut the ginger into tiny pieces and place along this centre hollow. Heat a little jam, and, if it is stiff, thin down with just a very small quantity of water, then rub through a sieve. Spread the edges of the halved bananas with this, then coat with the prepared almonds. Whisk the cream until it stiffens, sweeten and flavour to taste. Put this into an icing bag and force a line down the centre of each halved banana. Decorate with pieces of ginger.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF SEPTEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1938 AND 1937, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Sept.	No. of years' records.	Sept., 1938.	Sept., 1937.
North Coast.	In.		In.	In.
Atherton	0·73	37	0·95	1·19
Cairns	1·69	56	0·81	1·62
Cardwell	1·53	66	0·94	1·15
Cooktown	0·57	62	0·12	0·47
Herberton	0·56	52	0·35	0·60
Ingham	1·59	46	0·90	1·46
Innisfail	3·52	57	3·00	2·96
Mossman Mill	1·71	25	0·47	1·26
Townsville	0·76	67	..	..
Central Coast.				
Ayr	1·31	51	..	0·01
Bowen	0·80	67	0·07	..
Charters Towers	0·80	56	..	..
Mackay P.O.	1·55	67	0·14	0·51
Mackay Sugar Experiment Station	1·48	41	0·18	0·42
Proserpine	2·07	35	0·84	0·99
St. Lawrence	1·25	67	0·16	0·05
South Coast.				
Biggenden	1·54	39	0·13	0·33
Bundaberg	1·57	55	0·31	0·07
Brisbane	2·00	86	0·99	0·20
Caboolture	1·83	51	0·39	0·30
Childers	1·79	43	0·32	0·13
Crohamhurst	2·63	45	0·84	0·23
Esk	2·09	51	0·63	0·35
South Coast—contd.	In.		In.	In.
Gatton College	1·55	39	..	0·20
Gayndah	1·56	67	0·10	0·52
Gympie	2·10	68	1·66	0·74
Kilkivan	1·70	59	0·11	0·70
Maryborough	1·92	67	0·08	0·16
Nambour	2·48	42	0·86	0·32
Nanango	1·81	56	0·95	0·53
Rockhampton	1·29	67	0·01	..
Woodford	2·14	51	0·95	0·20
Central Highlands.				
Clermont	1·00	67	0·02	0·04
Gindie	1·05	39	..	0·05
Springsure	1·30	69	0·63	0·09
Darling Downs.				
Dalby	1·67	68	0·56	0·66
Emu Vale	1·76	42	0·95	0·78
Hermitage	1·56	32	..	0·75
Jimbour	1·47	50	0·37	0·35
Miles	1·34	53	0·96	0·31
Stanthorpe	2·28	65	2·18	0·17
Toowoomba	2·12	66	0·58	0·59
Warwick	1·82	73	1·41	0·76
Maranoa.				
Bungeworgorai	0·97	24	..	0·20
Roma	1·41	64	0·58	0·27

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—SEPTEMBER, 1938.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·99	85	68	84	15, 16	63	5	12	3
Herberton	..	73	54	83	15	46	1	35	3
Rockhampton	30·14	79	57	92	16	49	1, 13	1	1
Brisbane	30·19	73	53	87	16	46	4	99	4
Darling Downs.									
Dalby	30·17	76	46	85	15	33	1	56	5
Stanthorpe	..	67	39	76	28	26	1	218	9
Toowoomba	..	70	47	81	15, 17	37	1	58	6
Mid-Interior.									
Georgetown	30·10	89	61	98	16	50	6	..	..
Longreach	30·08	86	54	95	16	46	1	5	1
Mitchell	30·13	78	44	90	30	32	2	108	3
Western.									
Burketown	29·99	89	63	98	17	54	1	..	..
Boulia	30·04	87	54	100	28	47	12	..	..
Thargomindah	30·11	80	56	96	30	44	1	..	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	November. 1938.		December. 1938.		MOONRISE. Nov., 1938.	MOONRISE. Dec., 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	p.m.
1	5·3	6·9	4·49	6·31	11·58	12·25
					p.m.	
2	5·2	6·10	4·49	6·32	12·51	1·21
						p.m.
3	5·1	6·11	4·49	6·33	1·45	2·16
4	5·0	6·11	4·50	6·34	2·42	3·15
5	5·0	6·12	4·50	6·35	3·35	4·17
6	4·59	6·13	4·50	6·36	4·33	5·17
7	4·58	6·13	4·50	6·37	5·34	6·24
8	4·57	6·14	4·50	6·38	6·36	7·27
9	4·57	6·15	4·51	6·38	7·40	0·23
10	4·56	6·15	4·51	6·39	8·42	9·16
11	4·56	6·16	4·51	6·39	9·40	10·4
12	4·55	6·17	4·51	6·40	10·31	10·45
13	4·55	6·18	4·52	6·40	11·21	11·26
14	4·54	6·18	4·52	6·41	..	..
					a.m.	a.m.
15	4·54	6·19	4·52	6·41	12·5	12·4
16	4·53	6·20	4·52	6·42	12·45	12·44
17	4·53	6·21	4·53	6·42	1·30	1·22
18	4·53	6·21	4·53	6·43	2·2	2·1
19	4·52	6·22	4·53	6·43	2·43	2·44
20	4·52	6·23	4·54	6·44	3·20	3·30
21	4·52	6·24	4·54	6·44	4·8	4·17
22	4·51	6·25	4·55	6·45	4·47	5·7
23	4·51	6·26	4·55	6·45	5·32	5·59
24	4·51	6·27	4·56	6·46	6·30	6·25
25	4·51	6·28	4·56	6·46	7·12	7·43
26	4·50	6·29	4·57	6·47	8·6	8·31
27	4·50	6·29	4·58	6·48	8·59	9·26
28	4·50	6·30	4·58	6·48	9·49	10·18
29	4·50	6·31	4·59	6·49	10·39	11·10
30	4·50	6·31	4·59	6·49	11·32	12·4
31			5·0	6·50		1·0

Phases of the Moon, Occultations, &c.

6th Nov.	○ Full Moon	8 23 a.m.
15th „	☾ Last Quarter	2 20 a.m.
23rd „	● New Moon	10 5 a.m.
30th „	☽ First Quarter	1 59 p.m.

Perigee, 11th November, at 2.0 p.m.
Apogee, 27th November, at 1.0 p.m.

A partial Eclipse of the Sun, 21st and 22nd November, will only be seen on the western coast of North America, on the eastern coast of Asia, in Japan, and some small islands in the Pacific Ocean.

On the 25th Mercury will reach its greatest distance, 22 deg., east of the Sun, after which the little planet nearest the Sun will begin to decline rapidly.

Half an hour before sunset on the 29th Jupiter will be 7 deg. south of the Moon, which will set at midnight, half an hour earlier than Jupiter.

Mercury will seem to be stationary on the 4th December and Venus on the 9th, both travelling for a few days directly towards the Earth, after which they will appear to move with retrograde motion until they reach their western elongation as a morning star.

Mercury rises at 5.43 a.m., 40 minutes after the Sun, and sets at 7.10 p.m., 1 hour 2 minutes after it on the 1st; on the 15th it rises at 6.1 a.m., 1 hour 7 minutes after the Sun, and sets at 7.53 p.m., 1 hour 33 minutes after it.

Venus rises at 6.21 a.m., 1 hour 18 minutes after the Sun, and sets at 8.20 p.m., 2 hours 12 minutes after it on the 1st; on the 15th it rises at 5.12 a.m., 18 minutes after the Sun, and sets at 7.4 p.m., 44 minutes after it.

Mars rises at 2.37 a.m. and sets at 3.34 p.m. on the 1st; on the 15th it rises at 12.56 a.m. and sets at 1.22 p.m.

Jupiter rises at 12.21 p.m. on the 1st and sets at 1.30 a.m. on the 2nd; on the 15th it rises at 11.38 a.m. and sets at 12.50 a.m. on the 16th.

Saturn rises at 4.8 p.m. on the 1st and sets at 4.1 a.m. on the 2nd; on the 15th it rises at 3.10 p.m. and sets at 3.4 a.m. on the 16th.

At the beginning of November the Great Square, which rises and sets diamond-shaped, will be four-square on the Meridian at 9 p.m. with Saturn nearly in line with its eastern side, while the Scorpion is setting south-west, Orion is rising due east, but the great northern constellations will be seen to better advantage next month.

1st Oct.	☽ First Quarter	3 6 p.m.
9th „	○ Full Moon	7 37 p.m.
16th „	☾ Last Quarter	7 24 a.m.
23rd „	● New Moon	6 42 p.m.

Perigee, 9th December, at 1.0 a.m.
Apogee, 25th December, at 5.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, One Shilling, members of Agricultural Societies, Five Shillings, including postage. General Public, Ten Shillings, including postage.

Vol. L 1 DECEMBER, 1938 Part 6

Event and Comment

New Dairy Legislation.

IN the course of the debate in the Legislative Assembly on the Dairy Produce Acts Amendment Bill, which has since become law, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, dealt fully with many matters of especial interest to dairy farmers. The purpose of the new legislation, he said, was to overcome certain difficulties in the dairy industry, and that the first principle applied to the use of colouration agencies and disinfectants. Although in the principal Act there was power to regulate and prescribe the type of disinfectant and colouration agency that should be employed, it contained no power to confiscate disinfectants or colouration agencies that did not conform to the requirements of the regulations governing the standards of these commodities. The result had been that factories have had disastrous experiences, because certain colouration agencies and certain disinfectants which had not measured up to standard had been used. Quite obviously, the factories should get the protection it was intended they should have when the principal Act was passed.

The second principle of the measure was equally as simple, said Mr. Bulcock. It provided for the guaranteed certification of milk from disease-free animals, and that vendors would be fully protected in their use of the trade terms associated with the sale of such milk.

"In other words," he added, "it is proposed under this Bill to regulate the milk terminology. It is proposed to say to the farmer who tests his herd, 'We will give you every protection that we can.' And we should deprecate the exploitation of a non-existent certificate by unscrupulous milkmen who endeavour to gain some advantage because they see the fellow who has his herd tested is gaining a very material advantage. So it is proposed to legalise what up to the present has been a voluntary system. It is proposed to give the certificate issued in relation to this matter a legal status and to forbid people from describing milk in such a way as to falsely represent it and so gull the public. There is, I believe, a very strong and a very wide demand for milk from certified dairies; but it is not reasonable or just that a person should be permitted to say, 'This is a milk from a certified dairy' when it is nothing of the kind."

Continuing, the Minister said that the third principle of the Bill provided for the determination of what is pasteurised milk and what is raw milk; or what is reduced or frozen milk or stored milk, as the case might be.

The fourth principle of the Bill was the extension to cheese factories of requirements that applied to butter factories. It was true that the cheese industry was undergoing something in the nature of a transformation. It was equally pleasing to be able to say that whereas a few months ago there was a general outcry as to the quality of the cheese produced in Queensland there had been a marked improvement in the Commonwealth grading figures, which showed that the cheese industry was definitely on the up grade in respect of quality. When it was considered that the committee for nutrition associated with the Commonwealth National Health and Medical Research Council was specialising in the inclusion of a large cheese ration in the diet, one appreciated the fact that there was a considerable market in Australia that might yet be exploited, but that could be done satisfactorily only if the right quality of cheese were forthcoming.

"In order to discuss this and associated questions," stated Mr. Bulcock, "I attended a conference in Toowoomba, and there it was thought that it was not fair for the butter industry to have certain —shall I say?—restrictions placed on it, e.g., in relation to twenty-eight days' notice before a supplier could leave a factory, when these were not applied to the transport of milk to a factory. It will not be very long before the old practice of the individual taking his milk to the cheese factory will be entirely superseded by a new practice of the factory's making its own arrangements to collect the milk and transport it to the factory. Already there is a tendency in that direction. To-day two or three organisations are maintaining their own road transport and they are obtaining better service and better quality, and generally their practices are more balanced than when they depended on the supplier's turning up at any old time with his milk. Good cheese cannot be obtained, particularly in the summer months when milk has to stand in the vat over a long period waiting for a lagging supplier to arrive with his supplies to complete the vat before rendering it.

"At the request of the cheese industry and of the factories, it is proposed to give the factory the power to organise milk routes on the

same lines as those that have been adopted in relation to butter factories."

Under the new measure, canvassing for cream by the agents of a butter factory in the territory of another butter factory will be suppressed; likewise, other practices which are opposed to the true spirit of co-operation in the dairy industry and which have developed to its detriment in recent years.

Planned Production.

THE need for a world-wide understanding on agricultural production has become more evident as the result of rapidly changing conditions in world economy. Planning for sugar and wheat production is already the subject of international negotiation, and there is a feeling that the same thing should be done in respect of all other primary commodities for which there is a world market. As far back as forty years ago it was feared that the limit of world production was approaching and that humanity was faced with the possibility of universal famine. Scientific agriculture has dispelled that fear. The actual position now is that, unless we can increase consumption by properly feeding peoples who are now undernourished, we are over-producing many agricultural commodities of which a proportion is deliberately destroyed. A form of international adjustment, therefore, has become an urgent necessity as supplementary to the many national plans already put forward as attempted solutions of national production and distribution problems.

There is just as great a necessity for orderly production as there is for orderly marketing, and some world understanding along these lines will be a further contribution to the world peace—or appeasement—movement. Every country has been forced to consider this problem, and the feeling is growing that the old hit or miss methods of farming, and the folly of haphazard production of essential food crops and its alternative periods of glut and scarcity, must give way to orderly production and orderly marketing on the basis of international planning, understanding, and good will.

Farming as a Career.

MODERN farming is becoming as technical a business as most other skilled occupations. The tendency on the part of farming communities to send their brighter sons into town jobs is bad business from the farmer's point of view, and is a matter which calls for serious thought.

We want our better brains on the land to-day just as much as in the banks, the engineers' and accountants' offices, or the Public Service. A practical rural bias in our educational system should not only aid substantially in the solution of problems peculiar to farming, but indicate its outstanding advantages as a career for young Queenslanders.

Pests of the Grape Vine.

J. HAROLD SMITH, M.Sc., Senior Research Officer.

THE grape vine, like many other cultivated plants, is attacked by a wide variety of pests, several of which have been recorded in Queensland. Most of them occasionally appear in odd vineyards, or on merely a few vines within a vineyard, and control measures are usually applied, not in anticipation of an outbreak, but to deal with one already present, and threatening to become worse. Routine treatment for specifically pest control purposes is seldom necessary, but it is most important that the vigneron should keep a sharp look out for any one of the many species partial to the grape, so that losses can be kept to a minimum. In this article the commoner pests will be discussed in their order of importance to the State and not that of any single district.

The Grape Phylloxera.

The grape phylloxera* is perhaps the most serious grape pest known to the world and during current memory, its advent into various districts and countries has necessitated a complete change in established practices. In this State, an outbreak occurred in 1910, and drastic measures were then adopted in an attempt to eradicate the pest. In 1932, however, the insect was located in grape producing areas in the vicinity of Brisbane, and control methods based on experience in other States and overseas must be adopted if the industry is to persist in the area.

The grape phylloxera (Plate 207) is an aphid with somewhat specialised habits, but it feeds similarly to other aphids by means of piercing and sucking mouthparts, extracting sap from the plant structures that are infested. In some countries phylloxera occurs in two main forms, one of which feeds on the roots and the other on the foliage. Either of these may give rise to the other form. Winged insects which can be responsible for more widespread infestations may also occur. Fortunately, only the wingless root-infesting form has, as yet, been located in Queensland, and as it can only be distributed with planting material, the risk of the insect spreading to other areas, provided plants or cuttings are not moved from district to district, is comparatively slight Colonies of the minute, yellowish insects cluster together on the roots, and as a result of mass feeding over long periods these develop irregular lumps, somewhat similar to those caused above ground by the allied woolly aphis on deciduous fruit trees. As a sequel to the attack, the vines show symptoms of failure. New canes lack vigour, the leaves acquire a yellowish tint and the spring growth is sub-normal. Occasionally heavy crops may be borne by the vine before death occurs and the grower seldom appreciates the real position

* *Phylloxera vitifoliæ* Fitch.

DESCRIPTION OF PLATE 207.

THE GRAPE PHYLLOXERA (*Phylloxera vitifoliæ* Fitch).—Fig. 1, Egg x 60. Fig. 2, First Stage Radicicole x 60. Fig. 3, Later Stage Radicicole x 60. Fig. 4, Adult Radicicole x 60. Fig. 5, Nymph, ventral view, x 60. Fig. 6, Portion of Grape Vine Root showing Radicicoles and Eggs *in situ* x 4. Fig. 7, Nodosities on Rootlets x 4.

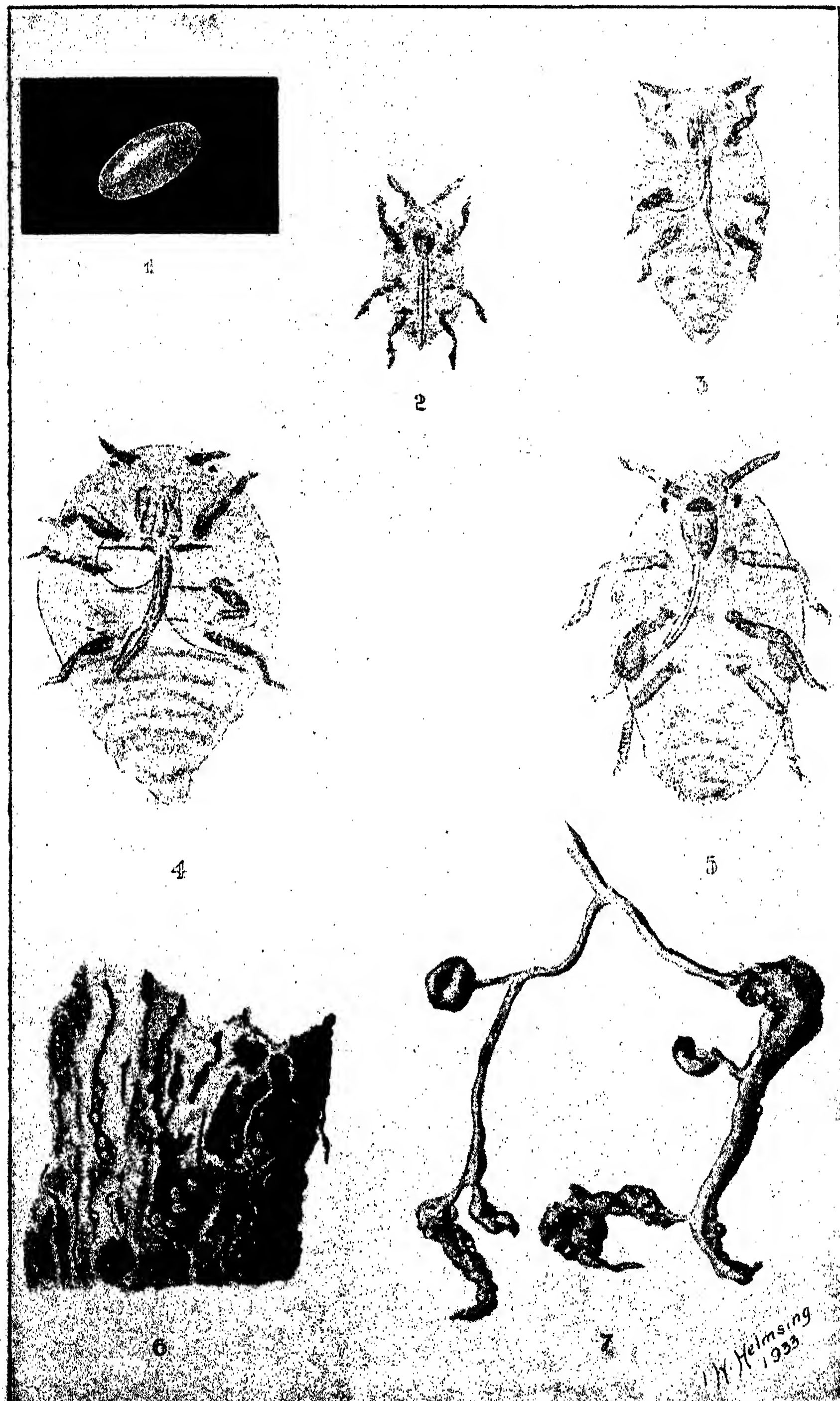


Plate 207.

until a vine fails to make the usual rapid growth in spring. Investigation then brings to light both the root failure and its cause.

Grapes are grown in several districts—Stanthorpe, Roma, the Brisbane area, and elsewhere. The pest is known only in the Brisbane area, where the grapes mature early and find a ready market in the city. The varieties grown near Brisbane include both American and European types. Most are grown on their own roots, and though the American varieties, e.g. Isobella and Iona, are still comparatively healthy, the European types, e.g. Muscat and Black Hamburg, are rapidly declining. The latter are commercially the more valuable and their loss to the district is of some moment. In other areas, phylloxera has not so far been located, and it is improbable that the pest has yet reached them. Two factors may explain this (1) the soil type may be unsuitable for the insect, and (2) the insect has never been introduced.

The pest does not thrive on very light soils, and it is doubtful if phylloxera could become very destructive in some grape producing districts. Others possess soils which are physically somewhat similar to those in areas known to be infested, and were it once introduced, the pest would almost certainly be injurious. Planting material should not, therefore, be purchased from outside sources for use in phylloxera-free districts except for special purposes when it should first be fumigated to ensure absolute freedom from insects before planting in the vineyard.

Once phylloxera is located in a vineyard, the grower is faced with two alternatives. He may either attempt to maintain the existing vines by attacking the aphids present or he may replant the vineyard wholly or in sections with worked vines comprising scions of European varieties grafted onto phylloxera resistant root stocks. The latter procedure, though drastic, is the more satisfactory, for attempts to control the pest by soil fumigation or comparable means are rarely successful, though they may sometimes give temporary relief. Growers for the most part root out and destroy vines which are failing as a result of phylloxera attacks. Flooding is practised in some countries to clear the pest from infested vineyards, water being maintained at a depth of 6 inches for a period of seven to ten days. Where practicable, flooding is effective, but the method gives no protection against subsequent infestation.

Existing regulations prohibit the movement of vines from an infested district.

In view of the difficulty in controlling the pest, it is not surprising that attention has, the world over, been given to the merits of stocks resistant to infestation, and it can be quite definitely stated that without these, the grape industry in most countries would have been irretrievably ruined. These stocks emanate from America, the original home of the insect, and their resistance to infestation may be the product of an age-long association of pest and host. The fruit borne by the more efficient phylloxera resistant vines possesses no commercial value, and the stocks are, therefore, used only as rooting systems for European varieties. As stock and scion relationships are very variable, the production of a good plant depends not only on the suitability of the stock for any given soil type, but also the compatability of scions with the approved stocks.

In countries and states where phylloxera has been a problem for some time, accumulated cultural studies and grower experience now permit the use of approved resistant stocks with each of the more important commercial scions. In Queensland, phylloxera attacks are comparatively recent, and the value of successful stock and scion combinations elsewhere has yet to be demonstrated or fresh combinations developed for use in areas infested at the present time. Preliminary work has already commenced with a number of selected resistant stocks, including Riparia Rupestris 3309, Riparia Rupestris 3306, Aramon Rupestris Ganzin No. 1, Mouvedre Rupestris 1202, Rupestris du Lot, and Riparia Berlandieri 420 A. Various types of scion such as the Muscats, Madeline Royal, and Black Hamburg are being worked on to these stocks, and it is hoped that enough data will later be available to permit precise recommendations for the area at present infested with phylloxera. In the meantime, growers in the Brisbane district who wish to replant land from which dead vines have been removed should first seek information on suitable varieties from the Department of Agriculture and Stock. The selection of phylloxera resistant vines can then be narrowed down to those showing promise in official experimental work.

Fruit Fly.

The grape is by no means a favourite host of the Queensland fruit fly*, but in years when the pest is abundant, losses may be severe. In some districts, the fruitgrower interested in a variety of crops generally regards infestation in grapes as a portent of heavy losses in later maturing fruits, the inference being that if the fruit fly population is high in early summer, the position will be more serious in late summer and autumn maturing crops.

The grape cannot be considered an ideal host for the pest, as the development of the insect is seldom completed in the fruit. Eggs are laid in the grapes as they approach maturity. These hatch and young larvæ emerge, but the conditions within the fruit are apparently unfavourable for development and the maggots die. The stung grapes show some discolouration round the egg puncture and sunken spots develop. Stung fruit is quite unmarketable, and must be trimmed from the bunches prior to packing.

Control measures should not normally be necessary, but when the pest is serious, vanilla-ammonia lure traps developed for use in fruit trees should be placed in the vineyard. These can conveniently be suspended to the wires along which the vines are trained and should be hung in shaded positions close into the plant.

Grape Thrips.

In some years, the grape thrips† is very destructive to the vine during the flowering period. These insects attack the young growth in spring, producing flower drop, faulty setting, and occasionally leaf fall and malformations in the growing point of the vine. The injury is due to mass feeding by innumerable thrips, the under-surface of the young leaves being eroded and the essential structures of the flowers destroyed. Outbreaks are rather sporadic, the most recent being in the year 1937.

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* *Chætodacus tryoni* Frogg.

† *Haplothrips froggatti* Hood.

The insects are approximately one-twelfth of an inch in length, dense black in colour, and move with a distinctive skipping flight. The eggs are laid within the tissue of the leaves or flowers through a saw-like ovipositor which makes the necessary incision in the surface. In hatching from the eggs, the young force their way to the outside of the leaf and commence to feed. After growing through a succession of moults, the wingless larvæ reach the pupal stage and finally transform into the winged adults.

The rapid rate at which these insects increase in numbers is such that control measures must be applied promptly if losses are to be kept within reasonable bounds. The grower may use either sprays or dusts for the purpose, and his choice will, in practice, depend on the facilities available in the vineyard. Nicotine sulphate is the most effective insecticide. Several proprietary nicotine dusts of varying strengths are on the market and the brand selected should contain not less than 2 per cent. of nicotine. A comparable spray can be prepared to the following formula:—nicotine sulphate, ½ pint; water, 50 gallons; soft soap, 2 lb. The soap is thoroughly dissolved in the water and the nicotine sulphate is added, the spray being then applied immediately.

Though both sprays and dusts are effective against adults and larvæ, the eggs survive treatment. At least two treatments are therefore, necessary to give complete control.

Mites.

A variety of mites attack the grape vine. One, the vine leaf blister mite,* is associated with the phenomenon known as erinose and occurs in colonies within blister-like erinia or felted galls on the under surface of the leaves, each erineum having a felt-like appearance due to abnormal leaf hair development on the attacked area. Two other species are relatively common. One† is more or less elongate, creamy white in colour and feeds on the leaves; the second‡ is larger, somewhat squarish in shape, transparent pink in colour and is generally found associated with scarred fruit.

All the mites of economic interest on the grape are very small and difficult to detect with the naked eye. Some types of injury are, therefore, frequently attributed to dry weather. This is partly due to the fact that under such conditions the mites are very prolific and the population increases rapidly to pest proportions. The mass feeding of innumerable mites on the under surface of the leaves induces a yellow colouration which is frequently most intense in the vicinity of the veins. In the more severe instances, dead tissue may appear in the leaf. The general effect on the vines is not unlike that caused by prolonged hot weather, and careful observations are, therefore, necessary to confirm the presence or otherwise of the pests. In the absence of special facilities, the grower should examine closely the under surface of the leaves, particularly in the vicinity of the veins, for signs of surface breakdown. The break in colour between attacked and healthy portions of the leaf is also much more clear cut than in dry weather effects, which produce tip and marginal yellowing in the

* *Eriophyes vitis* Land.

† *Phyllocoptes sp.*

‡ *Tenuipalpus sp.*

leaf in the initial stages. These symptoms are sufficiently diagnostic for ordinary purposes to indicate the necessity or otherwise for insecticidal control measures.

Mite attacks may cause some diminution in the area of effective foliage on the vine. In acute cases there may be actual shedding, but as a rule the leaves persist, though not functioning normally. The whole vine is consequently impoverished and the quality of the fruit suffers, the grapes being under-developed and lacking in juice content.

Mite populations fluctuate to some extent with weather conditions but the grower cannot rely on weather changes to rid his vines of these pests. Dilatory action may have undesirable consequences. Control measures should, therefore, be applied as soon as the mite damage is detected on the growing plants. Sulphur dusts are normally effective and if applied when necessary before flowering, subsequent treatments required for the control of powdery mildew should obviate any further trouble.

Though the infestation of a vineyard develops quickly the mites are frequently present on the plants even though no damage is apparent. Their seasonal importance depends to some extent on winter survival. During this period the vine leaf blister mite shelters under cover of the scales of the dormant buds, while other species find protection under loose bark on the older arms of the plant. A lime sulphur spray, prepared by adding one part of the commercial concentrate (polysulphide content not less than 16 per cent.) to ten parts of water and including an appropriate spreader, should therefore be applied before the buds commence to swell, if the pest has previously been troublesome. Such a precautionary measure will minimise the risk of damage during the growing period later in the year.

The Grape Vine Soft Scales.

The grape vine soft scales* are not uncommon in Queensland, though usually most prevalent in small orchards or private gardens where the vines are of little commercial importance and do not receive adequate attention.

The two more important species differ considerably in both size and shape, but possess somewhat similar habits. They are frequently clustered round the older canes and sometimes completely cover the underlying wood. They are brown in colour. In common with all scale insects they possess piercing and sucking mouth parts which abstract juice from the plant and to some extent weaken it. This phase of their activity is, however, less important than the marked development of sooty mould fungi which is usually associated with the insects. These fungi thrive on exudations from these scales and cover leaves, twigs and fruits of infested vines with a dirty coat consisting of matted fungal strands. These adhere closely to the fruit and affected bunches are unsuitable for either market or private use.

Control is relatively simple. The pest is commonly confined to a single vine and sometimes to a single cane. These latter should be cut out and destroyed when observed, particularly during normal winter pruning. If sprays are necessary, a miscible oil should be applied at a strength of 1 in 20 in the dormant period, after pruning operations have been completed. During pruning operations, the vigneron can

* *Saissetia nigra* Nietn. and *Lecanium persicæ* Geoff.

easily detect the presence of the scale and assess its probable importance in the following season. If only a few vines are attacked and pruning does not remove all the infested wood, the plants should be distinctively marked so that they can receive the appropriate spray treatment later on when convenient. Should control measures ever be necessary during the growing season, a 1 in 60 white oil spray should be reasonably effective.

Grape Vine Moths.

Quite frequently, grape vines are defoliated by the larvæ of various moths. The several species fall for the most part into two groups, the hawk moths and the large day flying Agaristids.

The hawk moths* are large heavy bodied insects which occasionally come to lights at night. The name very appropriately describes the distinctive shape and sweeping flight of the insects which distinguish them from most other moths. The larvæ are formidable looking creatures which grow up to three inches in length and possess a centrally placed recurved spine at the rear end of the body. Two or three of the greyish-green drab-coloured larvæ can completely defoliate a vine in a very short time. When full fed they descend to the ground and pupate under any available debris at the base of the plant.

The day flying Agaristids† are represented by two pests of the grape vine. The more common species has a wing span of approximately two inches. The colour of both body and wings is a rich black, but the forewings have large yellow flecks. A tuft of reddish hairs occurs at the tip of the abdomen. The eggs are laid either on the vines or on the stakes supporting them. The newly-hatched larvæ are more or less black, but as they grow, yellow, green and other tints are imposed on the deeper background and the fore part of the body is suffused with red. Growth is rapid and considerable injury may occur before development is complete. The larvæ then descend to the ground and pupate in earthen cocoons from which the adults subsequently emerge.

The larvæ of any of the leaf-eating grape vine moths can be controlled by applications of a lead arsenate spray prepared by mixing 1½ lb. of lead arsenate with 50 gallons of water and adding the appropriate amount of some suitable spreader. As an alternative, lead arsenate may be added to Bordeaux sprays, applied early in the season for the control of fungous diseases, at the rate of 1 lb. to each 40 gallons of the fungicidal spray. Outbreaks usually take place in spring before the fruit has set and the spray can then be safely used. Toxic deposits may accumulate on the fruit if spraying is attempted later in the season. Arsenical sprays must, therefore, be dispensed with on vines bearing fruit, and handpicking should be adopted. As the larvæ of most grape vine moths are large and distinctive, handpicking as a supplement to spraying in the spring is quite practicable.

Other Pests.

A number of beetles are occasionally injurious to the vine, sometimes as strays attacking odd plants here and there in the vineyard, sometimes as definite pests necessitating the use of control measures over the whole area.

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* *Hippotion celerio* L. and *Theretra oldenlandiæ* Fabr.

† *Phalænoides glycinæ* Lew. and *Agarista agricola* Don.

The red shouldered leaf beetle* may invade the vineyard at almost any time of the year, particularly in the coastal areas in the south. Only the adults are concerned and these arrive in immense numbers to attack the young growth. The losses may be severe on individual properties, though rarely over the whole district. A dust containing equal parts of pyrethrum and kaolin gives effective control and is best applied early in the morning. As a small proportion may survive the treatment of the vine, additional dust should be immediately blown over the stupified insects which fall to the ground when the dust is first applied to the vines.

A smaller, related, species† has sometimes been troublesome in inland districts and the same treatment would doubtless be effective in controlling it.

* *Monolepta rosea* Blkb.
† *M. divisa* Blkb.

FRUIT AND FLOWERS BY AIR—NEW MARKETS FOR AUSTRALIAN PERISHABLES.

One of the most interesting developments on the Empire air routes is the experimentation in the transport of fruit and flowers over distances hitherto considered far too great for their successful carriage.

On the Qantas Empire Airways section of the Sydney-Southampton route, the carriage of perishables has already passed beyond the experimental stage and there is a regular interchange between Malaya and Australia of mangosteens, orchids, and oysters.

With the extensive development in recent years of Australia's internal air lines providing rapid connection with the flying boat ports, the results achieved in this class of traffic on other sections of Imperial Airways' world network of services should be of interest to Australian growers and exporters.

Between South Africa, India, and Egypt, there is already a considerable development in perishable traffic. The growth of a large regular trade in these freights depends on the solution of commercial problems involving quality, condition, and cost.

Malayan orchids, costing 1½d. in Singapore and selling from 2s. 6d. upwards in Paris and London, are already a firmly established market. Cost of packing and carriage from Malaya to London does not exceed 3d. a bloom on large consignments, and packed in light lath crates the flowers travel well and last up to 14 days in a cold climate. Transport of Queensland orchids to New Zealand, for instance, may thus form a profitable export trade when the trans-Tasman service is established.

Similarly encouraging results have been achieved in the transport of fruit.

Paw-paws from South Africa have proved a profitable air freight for France and England. If picked slightly before maturity, they seem to require the minimum of preparation or special packing, and allow a good margin of time both for travel and for any reasonable delay in sales.

Figs and grapes, like flowers, are also reaching London from Egypt, but one of the lessons which has been learned is that air freighting of such goods does not absolve the shipper from paying attention to competition in his export market from hothouse and other forced-growth products.

Within those considerations there seems to be ample scope for the development of highly profitable long-distance export for a wide range of goods which have, up to the present, been confined to a limited sales area because of their perishable nature.

Studies on the Coliform Bacteria Found in Butter.

E. B. RICE, Dairy Research Laboratory. (Dairy Branch.)

THE object of this investigation, which is based on the results obtained from the biological examination of 131 samples of salted butter submitted in three competitions organised by agricultural show societies and factory managers' associations in Australia, was to determine—

1. The incidence of coliform bacteria in butter.
2. The effect on coliform bacteria of holding butter at 14° F. and 60° F.
3. The types of coliform bacteria present.
4. The relationship, if any, which exists between plate counts and the extent of coliform infection.

In view of the number of samples of butter examined from factories situated in all parts of Australia, the results should be fairly representative of the biological quality of butter made in this country.

Outline of Manufacture.—The butters were all manufactured from cream spontaneously ripened on the producing farms. The usual factory procedure is to standardise the cream to about 34 per cent. fat content, partially neutralise to about 0·1 to 0·15 per cent. calculated as lactic acid, then to pasteurise by the Flash process, or by a combination of pasteurisation and vacuum treatment, at temperatures varying from 185° F. to 200° F. These exposures are now almost universally used in factories with the exception of a few smaller plants which still use the Holder method.

Sampling.—Upon arrival at the Cold Stores the boxes of butter were placed in cold storage until all entries arrived. Before grading they were allowed to thaw for about four days in a room maintained between 50° F. and 60° F. Samples were taken just before grading commenced. The possibility of growth of bacteria in the butter during thawing must be kept in mind in interpreting the results of the investigation, although, because of the low plate counts obtained on many samples, it seems reasonable to assume that the alteration in the bacterial flora during the thawing of salted butter is slight, and indeed, as will be observed from Table 4, that the changes in coliform content even after an extended holding period at room temperature are almost insignificant.

Method of Isolation.

Portions of plugs of butter drawn with a sterile trier from the centre and one corner of each 56 lb. box of butter were melted in sterile 4 oz. pomade jars in a waterbath the temperature of which was thermostatically controlled at 42° C. 1 ml. of melted butter, and serial dilutions in warmed saline tubes were inoculated into tubes of

(*Note.*—This paper was completed while Mr. Rice was at the National Institute for Research in Dairying, University of Reading, and was read before the annual meeting of the Society of Agricultural Bacteriologists, Edinburgh, July, 1937.)

MacConkey's bile salt lactose broth containing Durham's fermentation tubes. The tubes were incubated at 37° C. for twenty-four hours, the presence of acid and gas after this period being noted as a positive presumptive test. Tubes not giving a positive reaction were returned to the incubator for a further twenty-four hours to determine whether slowly growing types were present. Confirmation of the presence of coliforms was established by streaking from the positive tubes on to eosin methylene blue agar plates (8) and, when colonies developed, examining them microscopically for gram negative rods and culturally for their ability to produce acid and gas in lactose broth.

Occurrence of Coliform Bacteria in Butter.

The distribution of coliform bacteria is set out separately for the samples submitted in each competition in Table 1.

TABLE 1.

DISTRIBUTION OF COLIFORM BACTERIA IN SAMPLES.

Coliform Titre.	Competition No. 1.	Competition No. 2.	Competition No. 3.
	Samples.	Samples.	Samples.
Absent in 1 gm.	7	42	21
1–10 per gm.	4	7	7
11–100 per gm.	5	4	8
101–1,000 per gm.	11	1	1
1, over 1,000 per gm.	8	2	3
Total Samples	35	56	40

It will be observed that, in contrast to the first competition where 80 per cent. of the butters were infected with coliforms, only 25 per cent. and 47·5 per cent. respectively, of those which entered the second and third competitions contained these organisms. It should be mentioned that in the first competition the thirty-five factories were taking part in such a contest for the first time, which probably accounts for the more extensive contamination of the samples submitted. Butters from many of these factories entered in subsequent contests were, bacteriologically, just as satisfactory as the majority of the samples; this, incidentally, indicates the value of making bacteriological examinations, in conjunction with the usual system of scoring for flavour, as a means of encouraging improvement in factory sanitation

Relationship Between Coliform Contamination and Plate Counts of Butter.

The distribution of samples in accordance with plate counts and coliform titre is shown in Table 2. The plate counts were made on standard agar (pH 6·8), the values recorded being the mean of duplicate plates.

Although this table reflects a fair correlation between the extent of coliform infection and plate counts, there are marked discrepancies in individual samples. There is, however, a distinct tendency for high plate counts to be accompanied by large numbers of coliform bacteria.

TABLE 2.

DISTRIBUTION OF COLIFORM BACTERIA TO PLATE COUNTS.

Plate Count (per gm.)	Number of Samples.	Coliform Titre (per gm.)				
		Absent.	1–10.	11–100.	101–1,000.	Over 1,000
Less than 50,000	67	50	9	5	3	..
51,000–100,000	16	7	1	5	3	..
101,000–200,000	17	6	3	2	3	3
201,000–300,000	6	2	1	..	1	2
301,000–400,000	5	1	1	2	..	1
401,000–500,000	3	..	1	..	1	1
501,000–750,000	5	1	..	1	2	1
751,000–1,000,000	3	1	..	1	..	1
Over 1,000,000	9	2	2	1	..	4
	131	70	18	17	13	13

Biological surveys of butter factories have shown wide variations in the counts on the cream immediately after pasteurisation, ranging from less than 1,000 to 80,000 per ml., depending upon such factors as the kind of pasteuriser used, the temperature attained and the numbers of heat resistant organisms originally present in the raw cream. Pasteurisation at temperatures near 200° F. immediately followed by treatment under vacuum, which is becoming increasingly common, gives a greater reduction in numbers than ordinary flash pasteurisation. The mean count on eight samples of cream from different factories pasteurised by the former method was 4,800 per ml. compared with a mean count of 27,500 per ml. for twenty-seven samples of cream from other factories flash pasteurised at 185° F. Although in the churning of the cream a large proportion of the surviving organisms will be carried away in the butter-milk. there will still be widely varying counts on the freshly churned butter, even if post-pasteurisation contamination be avoided. It is apparent, therefore, that the plate count cannot be regarded as a true index of hygiene in butter manufacture, but reflects rather the conditions of handling of the cream at the factory and prior to its arrival there.

It is considered that the presence of coliforms in a sample of butter may be presumed to indicate post-pasteurisation contamination, since numerous factory biological surveys have shown the efficiency of the pasteurisation exposures used in eliminating coliform bacteria. Of over 100 tests on treated cream taken directly from the outlet pipe of the pasteuriser at more than thirty factories a positive coliform reaction has not yet been recorded in 1 ml. Because of the ubiquitous occurrence of coliform organisms, and especially their presence on unsterile utensils and in impure water a search for these bacteria is recommended as a useful supplementary test for the biological control of butter manufacture.

In some countries the yeast and mould count of butter is alone used to judge factory sanitation. The experience in Australian factory control is that this is chiefly a guide to churn sanitation, the yeasts inhabiting the wooden churns.

Relationship between Coliform Bacteria and Grade Points.

There was no significant difference in grade points (score) between butters seriously contaminated with coliform bacteria and those in which these organisms were relatively few in numbers or entirely absent, or, indeed, between butters of high and low plate counts. This was more or less expected, as the butters were graded before the organisms had had time to proliferate.

Effect of Holding Butter at 14° F.

This part of the investigation was confined to thirty-five butters. After the arrival of the boxes at the Cold Store samples were taken for plating, the boxes were then placed in a refrigerated room at 14° F. for eight weeks, and when removed, further samples were taken and again plated. This temperature and period of storage were chosen to simulate conditions to which Australian butter is subjected on the voyage to Britain. Twenty-eight or 80 per cent. of the samples were infected with coliforms before going into cold storage, while these bacteria persisted in reduced numbers in 25 or 71 per cent. after their removal from the freezing room. The distribution of coliform bacteria in the butter, before and after cold storage, is set out in Table 3.

TABLE 3.

Effect of Eight Weeks' Storage at 14°F. on Coliform Bacteria.

Coliform Titre.	Number of Samples.	
	Before Storage.	After Storage.
Absent from 1 gm.	7	10
1–10 per gm.	4	6
11–100 per gm.	5	5
101–1,000 per g.m.	11	8
Over 1,000 per g.m.	8	6
	35	35

The decrease in coliform bacteria in butter which has been held in cold storage is in accord with the findings of Grimes and Hennerty (2) with Irish butter. Members of both the coli and aerogenes subgenera were detected in the samples after cold storage.

Effect on Coliform Bacteria of Keeping Butter at 60° F.

Plate counts and coliform tests by the dilution technique were made on eleven samples of salted and six samples of unsalted butter. The samples were then placed in an incubator at 60° F. and re-examined at varying intervals over a period of twenty-one days.

TABLE 4.

CHANGES IN PLATE COUNT AND COLIFORMS OF SALTED BUTTER HELD AT 60°F FOR 21 DAYS.

Age (days).	—	1	2	3	4	5	6	7	8	9	10	11
..	Plate Count	164,000	19,000	1,472,000	66,000	14,000	1,000	128,000	2,000	328,000	24,000	9,000
	Coliforms	++++	+	++	++	+	−	++	−	++	+	−
3	Plate Count	−	510,000	..	240,000	90,000	10,000	190,000	30,000	300,000	210,000	19,000
	Coliforms	++++	−	..	++	−	−	+++	−	−	+	−
7	Plate Count	170,000	740,000	1,000,000	60,000	790,000	107,000	820,000	10,000	520,000	270,000	74,000
	Coliforms	++++	−	++	+++	−	−	+++	−	−	+	−
14	Plate Count	1,060,000	849,000	590,000	400,000	670,000	440,000	2,269,000	660,000	5,200,000	150,000	92,000
	Coliforms	++++	−	+	++	−	−	+++	−	−	−	−
21	Plate Count	6,300,000	1,170,000	719,000	289,000	690,000	580,000	630,000	130,000	1,290,000	280,000	910,000
	Coliforms	+++++	−	++	++	−	−	++	−	−	−	−

− = Coliform bacteria absent in 1 gram.
\+ = Coliform bacteria present in 1 gram.
++ = Coliform bacteria present in 1/10 gram.
+++ = Coliform bacteria present in 1/100 gram.
++++ = Coliform bacteria present in 1/1,000 gram.
+++++ = Coliform bacteria present in 1/10,000 gram.

TABLE 5.

CHANGES IN PLATE COUNT AND COLIFORMS OF UNSALTED BUTTER HELD AT 60°F. FOR 28 DAYS.

Age (days).	—	1	2	3	4	5	6
..	Plate Count	390,000	230,000	120,000	145,000	134,000	664,000
	Coliforms	—	++++	++++	+++	++	++
3	Plate Count	14,000,000	9,000,000	8,000,000	25,000,000	5,000,000	4,000,000
	Coliforms	+++++++	++++++	+++++++	++++++	+++++	++++
7	Plate Count	18,000,000	42,000,000	32,000,000	45,000,000	51,000,000	..
	Coliforms	+++++++	+++++++	+++++++	+++++++	+++++++	..
14	Plate Count	39,000,000	16,000,000	212,000,000	98,000,000	114,000,000	19,000,000
	Coliforms	+++++++	++++++	++++++++	+++++++	+++++++	++++++
21	Plate Count	10,000,000	12,000,000	24,000,000	38,000,000	82,000,000	5,000,000
	Coliforms	++++++	++++++	++++++	++++++	++++++	++++++

— = Coliform bacteria absent in 1 gram.
\+ = Coliform bacteria present in 1 gram.
++ = Coliform bacteria present in 1/10 gram.
+++ = Coliform bacteria present in 1/100 gram.
++++ = Coliform bacteria present in 1/1,000, gram, etc.

Salted Butter.—It is clear from the results given in Table 4 that coliform bacteria are able to tolerate for lengthy periods the brine concentration in salted butter, but their reproduction is almost suspended. If the butter is kept at 60° F. for twenty-one days their numbers change only slightly; in some cases there is a slight increase, while in others there is a slight decrease. Other microorganisms, notably chromogenic micrococci, seem better adapted to the environment, for the total count tends to increase during the keeping period. In this connection, it should be pointed out that Australian butter provides conditions rather suitable for the development of bacteria, as (1) the pH usually falls within the range of 6·4 to 7·4 which is near the optimum for the bacteria commonly found in butter, (2) the moderate salt content, of about 1·0 to 1·5 per cent., does not completely inhibit bacteria. Since the growth of coliforms in salted butter is inhibited at ordinary temperatures, while other types of bacteria may multiply, the coliform test may be of some value in attempting to assess the actual hygienic condition under which butter, held for some time at temperatures permitting multiplication of bacteria, was manufactured.

Unsalted Butter.—For comparative purposes, six samples of unsalted butter were examined at the same time as the salted samples. Table 5 shows that the coliform bacteria multiplied very rapidly in the unsalted butter kept at 60° F. In every case the plate count also increased enormously.

The Classification of Coliform Bacteria Isolated from Butter.

Isolation Technique.—About a week before they were required, plates of Levine's eosin methylene blue agar (8) were poured. They were placed in the 37° C. incubator (which had been disinfected with formalin) for forty-eight hours, the covers being raised to allow moisture to evaporate and the agar to harden. The covers were then replaced, the plates incubated another four days at 25° C. and any plate which showed any sign of contamination was discarded.

A flamed platinum loop was inserted into a tube of bile salt broth which had given a positive presumptive test, withdrawn and transferred to a tube of saline. A loopful of this dilution was placed in the centre of a prepared agar plate and spread over the surface of the medium by means of a glass rod bent at right angles (2). The plates were incubated at 37° C. for forty-eight hours.

To purify, the cultures were re-picked and re-streaked in some instances as many as five times, but never less than three times, in order to resolve them as far as possible. Previous work (3) has shown the necessity to adopt special measures to purify cultures of coliform bacteria. Where there appeared to be more than one colony type on the original plate, fresh plates were prepared from each colony type. Observation under the low power of the microscope indicated only one type to be present on each final plate and, if the organisms were gram negative rods which produced acid and gas in lactose broth, a portion of a colony was streaked on to an agar slant for study of its biochemical reactions.

Biological Tests for Identification.

The organisms were classified according to the scheme devised by Malcolm (4), based on their ability to grow in Koser's citrate medium,

(5), production of indole (6), methyl red-Vosges Proskauer reaction (7) and the fermentation of inositol.

Altogether 107 cultures isolated from the sixty-one coliform positive butter samples, were studied and the results are classified in Table 6.

TABLE 6.

CLASSIFICATION OF COLIFORM BACTERIA FOUND IN BUTTER.

Name of Organism.	Number of Cultures.	Percentage.
Bact. coli	63	58·9
Intermediate (Citrobacter spp.)	25	23·3
Bact. aerogenes	3	2·8
Bact. oxytocus	11	10·3
Bact. cloacae	5	4·7

Summary and Conclusion.

The investigation revealed that coliform bacteria, in widely varying numbers, were present in sixty-one, or 46·6 per cent., of the 131 samples of butter examined. The mean total count was 245,000 per gram, the extremes being 670 and 3,800,000 per gram. Higher numbers of coliform bacteria usually accompanied high plate counts.

Members of both the coli and ærogenes sub-genera persisted in butter cold stored at 14° F. for eight weeks.

There was rapid multiplication of coliform and other bacteria when unsalted butters removed from cold storage were held at 60° F.

Although coliform bacteria persisted for lengthy periods in salted butter held at 60° F. their reproduction was practically suspended. The plate count, however, tended to increase.

The coliform bacteria isolated from butter have been classified.

It is concluded that a search for these organisms is a valuable supplement to other bacteriological examinations in assessing the hygiene of butter manufacture.

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Observations on the Dairy Industry of Denmark.

E. B. RICE, Dairy Technologist.

After attending the World's Dairy Congress, held in Germany in August of last year, Mr. Rice toured Denmark with a view to observing at firsthand the dairy industry of that country. In this article he gives an interesting account of his impressions and experiences, which will be read with appreciation by Queensland dairy farmers.—Ed.

THIS article is simply an attempt to give some impressions of the Danish dairy industry. Naturally, the widely different geographical situations, economic considerations, climates, and other factors of Australia and Denmark have resulted in the development of the industry, both in respect of farm and factory methods, along entirely different lines in the two countries. There are, however, many points in Danish dairy practice which, by suitable modification, could be applied to the industry in Australia.

Denmark consists of numerous small islands—about one third of the total area of the country—and Jutland, on the mainland, which occupies rather more than two-thirds of the area. The climate is warm and pleasant in the summer, but the country is subject to severe winds which make the winter rather bleak and necessitates the keeping of the cows under cover for about eight months of the year. The country is flat to undulating and the soil generally cannot be classed as rich, but good husbandry has improved its fertility. The neat, whitewashed cottages, usually with thatched roofs, and the well-kept farm buildings are a pleasing sight on one's first acquaintance with rural Denmark. The utmost use is made of every square yard of the farm, as intensive farming methods are necessary to provide sufficient fodder for the stock on the small areas usually occupied by each farmer. Another fact which soon impresses the visitor is the absence of fences to mark farm boundaries, and hedges so common to the English countryside. The tethering of the cows in the fields during the summer makes fences or hedges quite unnecessary.

DANISH DAIRY FARMING.

The prime importance of liberal feeding and scientific breeding in successful dairying is fully appreciated by the Danish farmer, and both are practised probably more extensively than in any other country. Every effort is made to grow as much as possible of the fodder required for stock feeding on the farm. The only cattle foodstuffs bought are cake concentrates. As the local production of these is insufficient to meet the country's requirements, a small quantity has to be imported. The cultivation of lucerne is becoming of increasing importance, because the feeding of this legume avoids some of the outlay for concentrates. Permanent pastures exist on comparatively few farms. Perennial ryegrass and red clover appear to be the most important constituents of pasture seeds mixtures, with timothy, trefoil, and other grasses, and the

trend is towards a simple rather than a complex mixture. Generally a seven or eight years' crop rotation is practised, there being a variety of choices as to the actual crops in the rotation. Oats, barley, rye and wheat are the cereals mainly grown, while roots are grown everywhere in abundance as they are looked upon very favourably as supplying succulence to the winter ration. Sugar beet is grown in some districts, the tops and factory residues being relished by stock. Silage is made on the larger farms, the A.I.V. method being mainly adopted. This method, propounded by Professor A. I. Virtanen, of Finland, consists in adding a dilute solution of hydrochloric acid to the material being ensiled for the purpose of adjusting the pH (acidity) to a point which checks plant respiration and inhibits the growth of certain bacteria which deteriorate the silage, but enables the desirable lactic acid fermentation to take place. It is also claimed that the nutritive value, especially the protein content of the silage, is enhanced by this process.

As in all European countries, haymaking is considered a farm practice of paramount importance in order to conserve fodder for the winter months when, unlike Australia, there is a complete absence of pastures. Because of the limited amount of sunshine, the Scandinavian hay-making method of hanging up the grass to dry on wires stretched between posts is adopted. Hayricks are not seen at all on the fields, as all hay is stored in lofts above the cowsheds.

Plate 208.

Red Danish dairy cattle on a farm in Denmark.

Another interesting feature of Danish dairying is the practice of tethering the cows on ropes in the fields, hence the reason for doing without fences. For about four months in the summer the cows are tethered in the fields night and day, being changed frequently from place to place. Consequently, the fields are grazed evenly and completely. The grass is fed off at its maximum nutritive stage, and

the manure also is spread evenly over the fields. The milkers go out into the fields three times daily to milk the cows there, and a cart is driven round to pick up the milk. Milking is done almost entirely by hand. The average farm probably has a herd of about fifteen to twenty cows in milk. During the remaining eight months of the year, the cows are housed indoors and are never taken out into the fields. The modern cowsheds are roomy and well lighted, and the standings provide ample space for each animal.

While the cows are out at grass, concentrates may be given to the highest producers, but the others rely entirely on grass. In the winter, hay and roots, and silage on farms where it is made, are given for maintenance; and cake concentrates, according to milk yield, are fed for the production ration.

Danish System of Food Standards.

The Danish system of compounding rations is simple and has been found satisfactory in practice.

The standard is taken as the quantity of food required to produce one pound of milk.

The equivalents of some foods commonly used in the country are:—

$2\frac{1}{2}$-3 lb. of good meadow hay equals one standard.
4 lb. poor hay equals one standard.
10 lb. swedes equals one standard.
12 lb. white turnips equals one standard.
4 lb. potatoes equals one standard.
10 lb. green fodder equals one standard.
6 lb. buttermilk or skim milk equals one standard.
12 lb. whey equals one standard.
1 lb. new milk equals one standard.

Plate 209.
Stacks of winter feed on a dairy farm in Denmark.

For the cow's maintenance one standard of bulky food or roughage is needed for every 150 lb. live weight, and for the production portion of the ration one standard of concentrates for each pound of milk yielded.

Effect of Foodstuffs on Butter Consistency.

Exhaustive feeding experiments were carried out some years ago to determine the influence of the various feeding stuffs included in the cows' rations on the firmness of the butter. According to their effects, foodstuffs were classified into three classes, (*a*) those causing softness in butter; (*b*) those giving dry and crisp butter; and (*c*) those producing normal butter. As many of the foods experimented with are rarely used in Australia, it is not proposed to refer to them individually here. The proportions of the different constituents in the concentrates and other foodstuffs distributed by stock food manufacturers are now carefully controlled, to ensure that the cows' rations will be without detriment to the body and texture of butter.

Cattle.

The dairy cattle in the country number about 1,750,000. The chief breed is the Red Danish, which seems to be almost exclusively kept on the islands, while the Jutland, a black and white animal, is kept largely on the mainland. The animals of both breeds are comparatively large. The pursuance of a policy of systematic and energetic herd testing over many years has considerably improved the average yield of Danish cows, which is about 700 gallons yearly, equivalent to

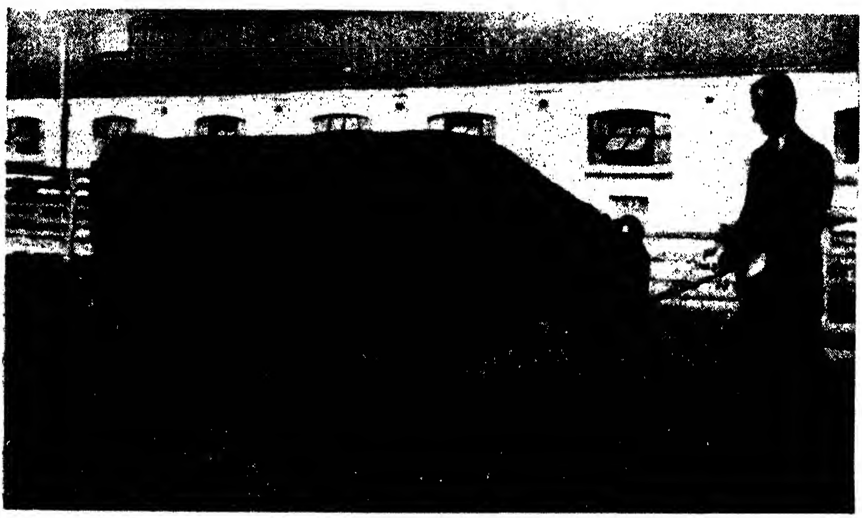


Plate 210.

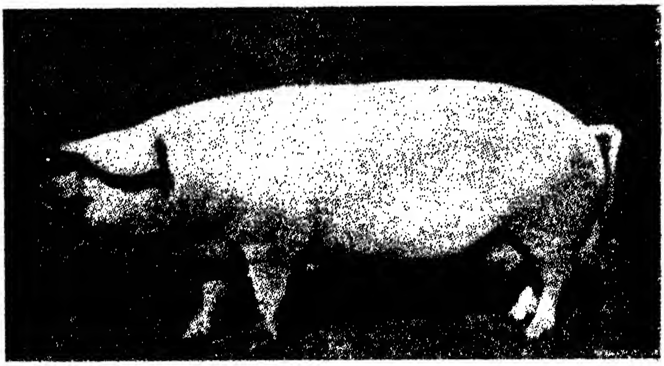
A typical bull of the Red Danish breed of dairy cattle.

300 lb. butterfat. These figures very clearly emphasise the benefit to be derived from herd testing, combined with culling, sound feeding, and scientific breeding practices. Besides the two native breeds, shorthorn cattle are kept in fair numbers, as well as the Channel Island breeds on a few farms. All cattle entered in cattle shows are judged, not alone on their

exterior appearance, but also on the milk yield. This characteristic feature of Danish cattle shows is considered to have been a factor of great importance in the development of cattle breeding. Nowadays, size and conformation are the only points on which judgment is placed, no consideration being given to head, horns, eyes, skin, and coat, or the indirect milk signs, such as milk veins, milk wells, &c. Of all the milk produced. about 80 per cent. is converted into butter, 10 per cent. is used on the farms and the liquid milk market, and the remaining 10 per cent. goes into cheese-making and manufactured milk products.

Pig Breeding and Feeding.

With an abundance of separated milk, which is always available from the buttermaking industry, it is only natural that pig raising is an important branch of dairy farming in Denmark. Whole milk is delivered by the farmers to the creamery, where it is separated and the separated milk is returned on the following day to the farmer.

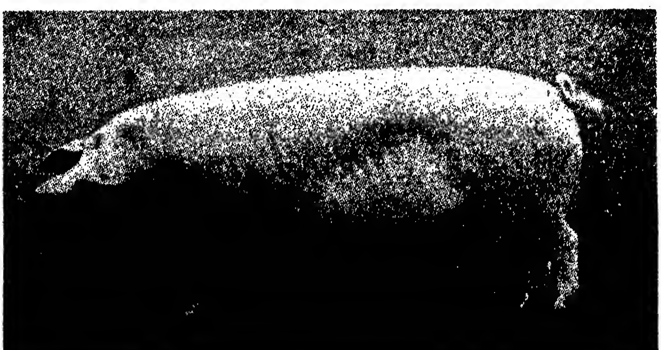


[*Photo.: Pig Breeders' Annual (England).*

Plate 211.

A Danish Landrace sow.

The national breed of pig is the Landrace, which has developed as a cross between a native breed and the Yorkshire Large White.



[*Photo.: Pig Breeders' Annual (England).*

Plate 212.

A typical pig of the Danish Landrace breed which was evolved from the old Landrace and Large White Yorkshire cross. The Danish Landrace is a uniform and regular breed which increases weight quickly and yields a good bacon quality.

Government control of the pig industry, by regulating the production of bacon to satisfy local and export requirements only, is designed to avoid over-production.

The meal mixture, fed to pigs with skim milk, is crushed on the farms from home grown cereals. Roots and potatoes form the balance of the ration.

With the object of preventing the dissemination of disease—tuberculosis particularly—among livestock, the pasteurisation by the creameries of all separated milk before its return to the suppliers is legally enforced. The creameries also add a "starter" of lactic acid bacteria to the separated milk which causes it to sour before the farmer receives it. This fermentation checks the activity of harmful bacteria, which, if allowed to multiply in the buttermilk, may cause digestive disorders or more serious illnesses in pigs consuming it.

Calf Rearing.

It is customary for the farmer to breed all his own stock. The heifer calves are retained for replacements in the herd, while only the bull calves from high-producing dams and sires of proved prepotency for high milk production in their female offspring are reared for breeding purposes. Autumn is calving time for most of the cows, so that the calves, after spending the winter indoors, can be put out to grass in the spring when they are about six months old and are able to use the pasture growth to full advantage.

Progeny Testing of Bulls.

The progeny testing of bulls, or, as it is often called, bull indexing, enables the breeding value of a dairy bull to be assessed by a comparison of the yields of its progeny with the yields of their dams. Progeny testing is receiving consideration in many countries at the present time, but although it appears to be a simple matter to make the comparison just mentioned, in practice there are many difficulties in the way of obtaining reliable figures, for, among the many factors which affect the data, investigators have pointed out the following:—(1) identification of the daughters; (2) reliability of the milk records; (3) definition of lactation period; (4) adjustment of lactation yields for age; (5) adjustment of lactation yields for dry period and service period; (6) adjustment for frequency of milking; (7) variation in management conditions; (8) number of daughters required to prove a bull; (9) consideration of the yield of the dam; (10) quality of the milk, such as fat percentage, &c.; (11) the breed type and conformation of the daughters.

When the true merit of a bull is discovered by the test, which is not until his first lot of daughters have completed a lactation period, the bull will be about five years old, and to retain it for some years afterwards creates certain difficulties, such as the management of an old bull and the risk of inbreeding. However, these problems, which are not insoluble, are all being closely studied, and no doubt much greater significance will in future years be attached to progeny testing, and prepotent bulls capable of siring daughters whose yields surpass their dams will be retained as long as they are useful, while others will be slaughtered before they can cause any serious decline in the productivity of a herd.

Bull Clubs.

Since the earliest times, because of the small area of each farmer's holding, it has not been usual for the individual farmer to own a bull. A number of farmers in a community co-operate to form what is known as a bull club, which purchases one or more bulls for the use of members of the club. The bull clubs, which are assisted by Government grants, have had a very strong influence on the raising of the Danish dairy stock to their present high standard, for the bulls in the possession of the clubs are obviously of superior quality.

Artificial Insemination.

In Russia and Denmark artificial insemination of dairy cattle has advanced beyond the experimental stage. On one of the Danish islands 1,200 cows were artificially inseminated in a year, two bulls only being used for the purpose. The utmost use which may be made of bulls out of high-producing dams and sires of proved prepotency for high milk yields in their offspring is a special feature of artificial insemination. In very closely settled farming communities in some European countries, this method may become more general.

Herd Testing.

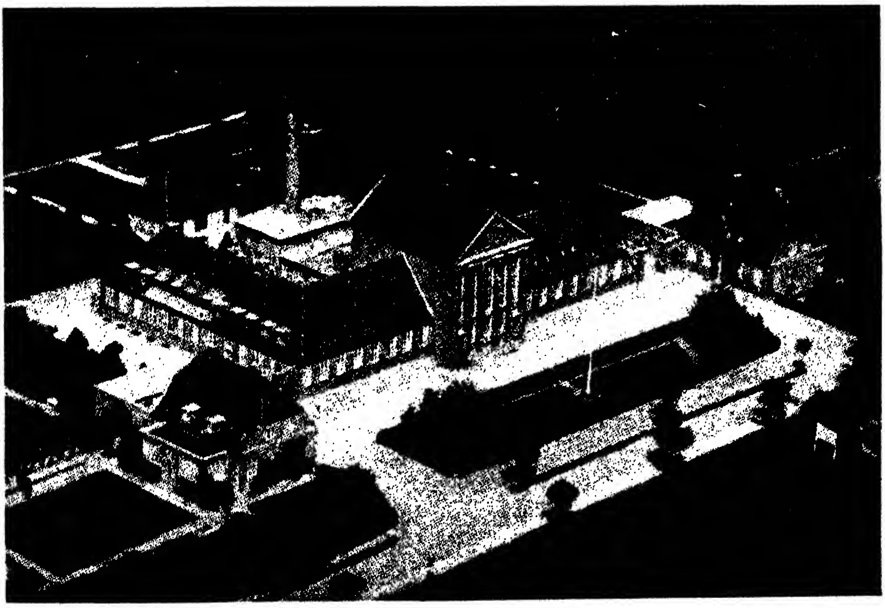
In no other country in the world has herd testing made greater progress than in Denmark, where approximately 40 per cent. of all milch cows have been entered on the milk recording societies' registers. The following table taken from the International Review of Agriculture, February, 1935, illustrating the development of herd testing in various countries, is, it is thought, well worth inclusion here:—

Country.	Year.	No. of Farms.	No. of Cows.	Approximate No. of Cows per Head.	Average Percentage of Cows Tested.
England and Wales ..	1932–33	4,958	135,902	29	4·7
Scotland	1933	741	32,456	44	13·0
Northern Ireland	1934	2,544	15,050	6	6·0
Irish Free State.... ..	1934	4,186	49,052	12	4·0
Canada	1933–34	4,351	58,571	13	1·7
New South Wales ..	1932–33	2,500	69,096	28	6·8
Victoria	1932–33	3,383	108,733	32	13·4
New Zealand	1932–33	6,332	278,104	44	16·6
Denmark	1933–34	49,903	701,087	14	39·6
Finland	1931	20,456	239,069	12	18·4
Netherlands	1932	15,185	159,157	10	12·2
Sweden	1932–33	17,803	300,855	17	14·7
United States	1934	13,694	335,437	25	1·3

BUTTER MANUFACTURING IN DENMARK.

There are 1,700 creameries (butter factories) scattered over Denmark, the capacity of most of which is very small compared with that of Australian factories. Probably no farmer lives further than five miles from the creamery he supplies, and the farmers deliver their milk daily to the creamery. The creameries are almost entirely owned co-operatively by the suppliers, and in fact, Denmark affords an excellent example of successful achievement by co-operative enterprise in many spheres.

The geographical situation of the country—Danish butter arrives at the English seaports within thirty-six hours of its shipment—permits the manufacture for export to the United Kingdom of starter-ripened "lactic" flavour butter. This kind of butter undergoes deterioration if held in cold storage, so that the butter exporting countries of the Southern Hemisphere have had to evolve a type—neutralised and pasteurised cream butter—which remains fresh after cold storage during the long sea voyage to Britain. Danish butter is actually shipped direct to the eastern seaports of Britain, only a small proportion going to London. On the other hand, Australian and New Zealand butter is mainly shipped to London. Resulting from marketing organisation, British consumers' preferences in the matter of butter flavour can be divided into two sections. In Scotland, Northern England, and the North Midlands, consumers, through long use of Danish butter, have acquired a liking for the fuller aroma and "lactic" flavour, while in the South Midlands and Southern England a neutralised cream butter, like Australian, is more sought after. In the South, Danish butter is eaten only by a small proportion of the people who are prepared to pay a slightly higher price for it, because of the reputation for uniform quality which it has had for many years.



[Photo. by courtesy of The Agricultural Council, Copenhagen.

Plate 213.

The Government Experimental Dairy, Hillerod, Denmark.

Consumers are also critical of butter colour. In Northern Britain, people accustomed to the paler European butters often look with suspicion on richly coloured butter from the southern hemisphere. Evidently they have not been educated on the relationship existing between degree of colour (provided annatto or other colouring substance is not added) and vitamin content of butter, research having shown that the deeper yellow Australian and New Zealand butters, produced from the milk

of cows which are pasture fed in the sunshine throughout the year, possess higher vitamin contents than butter from countries where the cows have to be stalled and hand-fed during a long period every year.

Sampling, Grading, and Method of Payment.

Each supplier's milk is sampled daily, the sample being placed in a composite sample bottle containing preservative and the fat determined on the composite sample by the Gerber method each week. Payment is based on the fat content and hygienic quality as judged by the methylene blue reductase test, which was devised by Professor Orla Jensen, the eminent Danish dairy bacteriologist. The test depends upon the ability of bacteria to decolourise a dilute solution of methylene blue, a dye substance, the rate of reduction of the colour being proportional to the numbers of bacteria in the milk. According to the test, which is made of each supplier's milk every week, the milk is classified into four grades, as under:—

Grade 1.—Milk having a reduction time of more than five hours;

Grade 2.—Milk having a reduction time between two and five hours;

Grade 3.—Milk having a reduction time between twenty minutes and two hours;

Grade 4.—Milk having a reduction time less than twenty minutes.

Suppliers whose milk falls into either grade 3 or grade 4 are penalised by receiving a somewhat lower rate of payment for all milk supplied in the succeeding week.

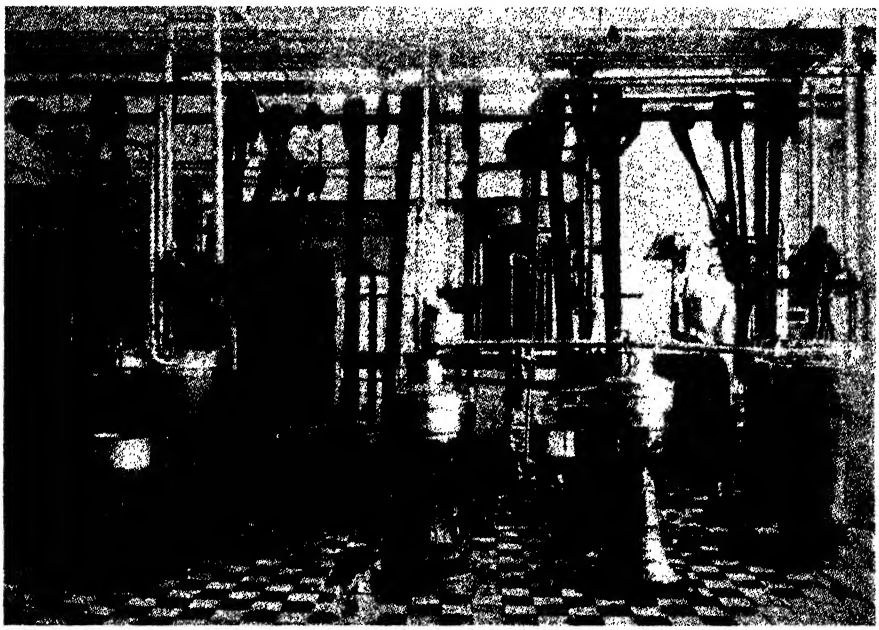
The delivery of whole milk and its separation at the creamery enables the manager, by the use of a mixed culture of bacteria as "starter," to have full control of the cream ripening and so develop the most desirable aroma and flavour. This is undoubtedly a distinct advantage which the Danish factory manager has over the Australian manager, for, because of the rapid expansion of dairying in sparsely settled districts, daily delivery of cream is an impossibility at the present time in many parts of Australia.

Pasteurisation and Cream Ripening.

Factory design, the layout of equipment and the system of butter manufacture are fairly uniform throughout Denmark. The milk after being sampled, is tipped into a weighing vat, the weight recorded, and it then goes into a holding vat.

Neutralisation is, of course, unnecessary. The whole milk is pasteurised at 176 deg. Fahr., cooled to about 100 deg. Fahr., and immediately run through the separator, which is regulated to deliver a cream of about 25 per cent. fat test. The separated milk is pumped away to holding tanks outside the factory, while the cream is passed over a second pasteuriser having its temperature raised to 190 deg. to 200 deg. Fahr. It is shock-cooled to about 40 deg. Fahr. and pumped to cream ripening vats. After two or three hours to enable the fats to partially solidify the cream is warmed to about 60 deg. to 70 deg. Fahr., about 4 per cent. of starter added, and ripening allowed to proceed for about ten or eleven hours. There are, however, modifications of this ripening procedure in different factories, necessitating the

use of up to about 10 per cent. of starter and different ripening temperatures. When the desired acidity is reached—that is, about 0·45 per cent. calculated on the fat free cream (so that actual acidity allowed to develop in the cream depends upon its fat test)—the cream is cooled down to churning temperature or slightly lower, varying from 48 deg. to 56 deg. Fahr., and maintained at this temperature overnight.



[Photo. by courtesy of The Agricultural Council, Copenhagen.

Plate 214.

Interior of a Danish dairy.

The bulk starter added to the vat has an acidity of about 0·9 per cent., it being ripened to this extent to allow certain of the constituent bacteria which produce diacetyl—to which butter chiefly owes its aroma and flavour—to establish themselves.

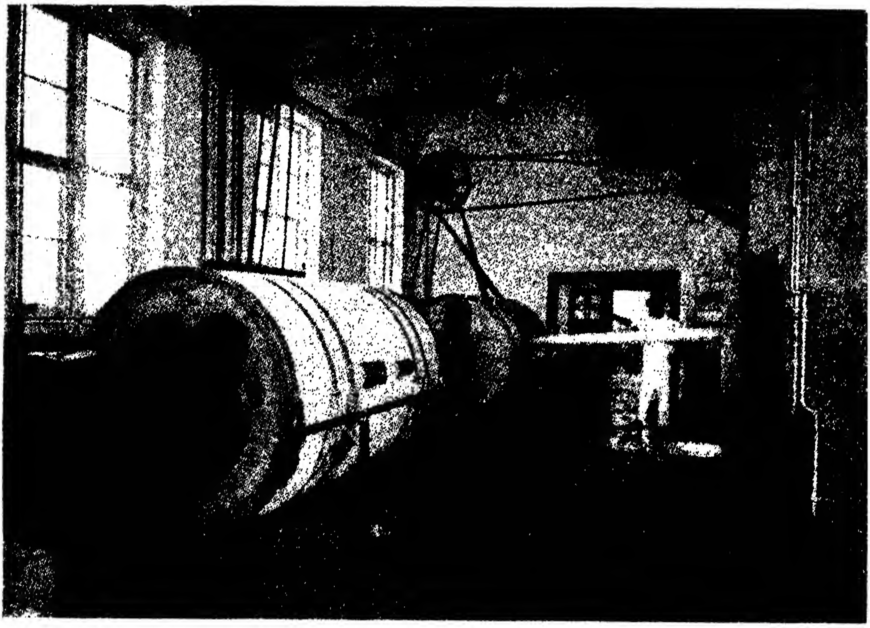
It will be evident that considerable attention is imperative if a uniform quality butter of this type is to be produced, for any carelessness leading to over-development of acidity, contamination of starters, &c., quickly spoils the quality and especially the keeping properties of the butter; but in the important operations of cream ripening and starter. propagation, Danish buttermakers possess high technical skill.

Churning, Working, and Salting.

Churning temperatures are higher than in Australia, ranging from 48 to 57 deg. Fahr., according to the season of year and other well known factors, but in other respects—such as size of grain, relationship between washwater and churning temperature—there is not any very great difference.

The Danish Butter Control Station attaches importance to the thorough working of butter, as butter containing free moisture or large droplets is more susceptible to bacterial deterioration than butter in which the moisture droplets are very finely dispersed. All samples at this station are subjected to a test which shows up underworking by placing paper saturated with an indicator solution on an exposed surface. Overworking must also be avoided, and so it becomes necessary for the buttermaker to judge the point at which the moisture is just completely incorporated.

Most Danish butter is unsalted, although a small quantity is lightly salted, averaging, I was informed, only 0·6 per cent. salt.



[Photo. by courtesy of The Agricultural Council, Copenhagen.

Plate 215.

Butter churns at the Government Experimental Dairy, Hillerod, Denmark.

At the Danish Experimental Creamery at Hillerod, the churn-room is supplied with near-sterilized filtered air to reduce the degree of mould and bacterial infection of the butter. For the purpose of comparing the relative costs of various sources of power, electric, steam and diesel power plants are being operated in turns of a week each over a period of twelve months.

A stassaniser is operated at this creamery for the pasteurisation of milk for liquid consumption. In this system the milk is heated in narrow tubes to 167 deg. Fahr. for fifteen seconds, a temperature sufficiently high to destroy pathogenic bacteria without imparing the cream line or affecting the vitamins.

Danish Butter Control Station.

This station controls the quality of all butter made in Denmark, and, based upon the results of its examinations, the right to use the "Lur"

brand is conferred on creameries. Periodically, and never less than three times yearly, creameries receive a telegram to forward a cask of the butter in stock to the station; the date upon which the butter must have been made is stated. Formerly, the cask of butter had to remain in a room at 57 deg. Fahr. for two weeks before scoring began, but now as soon as the cask arrives a piece is bored from the centre with a large trier, and the remainder either sold or returned at once to the creamery. The sample is held at 57 deg. Fahr. for two weeks, being scored upon arrival and at the end of a fortnight. A panel of ten judges, representative of exporters, creamery managers, and Government officials does the grading. The judges are divided into batches of three, the individual judges examining each sample independently, and all samples being examined by all ten graders. Any creamery of which the product falls below standard more than three times, is liable

[*Photo. by courtesy of The Agricultural Council, Copenhagen.*

Plate 216.

Butter cask with Lur-brand and control slip.

to forfeit the privilege of using the "Lur" brand. The members of the panel, except the Government official in charge, are changed from time to time.

During examination, the samples are simply marked by a number so that the judges are unaware of their identity.

At the end of the holding time, samples of all butter are submitted to the following bacteriological tests:—Catalase test to afford a measure of bacterial activity; a test for the presence of moulds able to grow on butter; and the test for extent of working referred to previously. Danish butter is much less susceptible to bacterial deterioration than the low acid Australian butter, but, on the other hand, moulds and yeasts are often a serious problem with this type of butter.

Marketing.

All butter exported must bear the "Lur" brand on the staves of the cask, the date of manufacture, net weight, and the creamery's official distinguishing number. The "Lur" mark, therefore, like the Australian Kangaroo mark, is a national guarantee of quality. The export of butter is handled by a number of co-operative export associations formed by a group of about 100 creameries. In addition to the Government control scheme, these associations conduct a weekly scoring contest of their members' butter and pay a small bonus for quality.

Cheese.

Only brief mention needs to be made under this heading, for only about 5 per cent. of the milk produced is made into cheese, and cheddar cheese, almost the only variety produced in Australia, is not apparently manufactured in Denmark. Germany is the chief purchaser of Danish cheese, but England takes a small quantity. The kinds made are Danish Swiss (Gruyere), Gouda, Edam, and Danish Blue (Roquefort type).

Dairy Training and Education.

There are numerous schools in Denmark for the training of young people in agriculture, dairying and related subjects, and the courses range from elementary to post graduate research work. There are two special dairying schools and two schools for training milk recorders (herd testers). The Royal Veterinary and Agricultural College, Copenhagen, offers a degree course in dairying to selected youths who have had practical creamery experience. Graduates of this college usually find employment in the Government service. Various schemes, such as apprenticeship on large holdings, are designed to ensure that young farmers will gain sound practical experience.

Research Institutes.

The State Experimental Dairy at Hillerod receives milk from about 120 suppliers and is managed exactly as any commercial creamery. When it is desired to test on a large scale the results of any bacteriological, chemical, or other technical research applied to manufactured milk products, the investigations are made at this creamery. Adjoining the creamery are two State experiment farms, where investigational work on dairying and pig raising is carried out. Professor Orla Jensen, one of the world's foremost dairy bacteriologists, who is attached to the Technical High School, Copenhagen, and Professor Soncke Knudsen,

of the Royal Agricultural College, who has made many notable contributions to applied dairy bacteriology, both work in close collaboration with the Experimental Creamery and the Control Station, and have been responsible for introducing many of the routine tests now carried out at the creameries and the Butter Control Station.

Acknowledgment.

It is desired to make grateful acknowledgment to all Government officials, members of staffs of the Royal Agricultural College and the Technical High School, factory managers, and others with whom I came into contact during my visit to Denmark, for hospitality extended and for information and literature made available to me; and also for their help in planning an itinerary that permitted me to see so much of the dairy industry of a remarkably interesting country, and of its fine and progressive people.

Plate 217.

BINGIL BAY, NORTH QUEENSLAND.—This view is typical of the scenic charm of a thousand miles of Queensland coastline inside the Great Barrier Reef, which has been described as "the eighth wonder of the world."

Fodder Storage.

A DARLING DOWNS FARMER'S EXPERIENCE.

Following is a report by Mr. W. Newman, of St. Athan, Wyreema, a well-known Darling Downs farmer, on large-scale fodder conservation as practised on his own property. Mr. Newman's account of his methods, and of the work and costs involved, which he has submitted through Mr. Philip Round, Dairy Inspector, Pittsworth, will be read with interest by farmers who are contemplating the establishment or extension of their own fodder reserves, and will be appreciated generally.—Ed.

HAVING had very bad seasons in 1934-35-36, during part of which we were hand feeding 150 milkers as well as dry stock, I decided that I would have to conserve a lot more fodder than ever before and, to feel safe, that it would be necessary to do it on a larger scale and in a shorter time than would be possible with lucerne or other hay.

1936, it will be remembered, was a very bad year, but, with the use of an old corn binder in harvesting, I was able to fill a gravel pit with 350 tons of green fodder. The enterprise proved successful, and, with the experience thus gained, I planted 70 acres of broadcast saccaline and 40 acres of maize in the following year. With a good harvest in prospect, provision for more extensive fodder storage was then decided on, and a second-hand slide scoop of $1\frac{1}{4}$ yards capacity was bought.

Using a 22-36 tractor, four pits on the trench style, 30 feet wide, 6 feet deep and varying in length from 90 to 180 feet were scooped out. The total capacity of the four pits was over 3,000 cubic yards. To get the sides of the pits nearly vertical, I think it is necessary to use a slide scoop, so as to get close to the banks. (Plates 218 and 219.)

Plate 218.
The slide scoop in operation.

The 22-36, being a wheel tractor, needs careful handling with this large scoop to prevent sinking into the loose dirt, but, after the first pit, we had no trouble and could get out about 200 yards a day.

Plate 219.
Excavating a trench pit with a tractor-drawn scoop, showing roadway at the side of the trench.

On each side of the pit, about 12 feet (Plates 219 and 220), was kept clear of spoil from the excavation. This space was for use as a roadway for the truck and wagons. The dirt taken from the pits was tipped on the outside of these tracks for the full length of the pit, so as to facilitate the covering of the ensilage when the pit was full.

Plate 220.
On the up-grade; note the clear ground on the edge of the excavation.

The soil on the site was heavy black for about 18 inches, and then gravel and rotten rock down to 6 feet, after which it was very hard.

The crop having grown well, I wished to get it in as quickly as possible with as little labour as I could do with. The machinery used included a 22-36 wheel tractor; a McCormick corn binder; a 6-feet McCormick grain binder; a 30-cwt truck, with 2-3 ton wagons.

From my experience last year, I realised that it took longer to unload the wagons than it took to load them, so it was decided to try to overcome this delay as well as easing the work.

Plate 221.

Tractor hauling two wagons with a load of about 6 tons. The standing saccaline crop in the background had grown up to 12 feet in height; it yielded over 15 tons to the acre.

Each wagon had a hay frame on it and I tied 5 ropes (1½ inch circumference) equally spaced to the main side member on the right side under the floor. The ropes were then taken outwards and then up over the hay frame and across to the left side of the wagon. They were then tied to a piece of hardwood (4 x 4, the same length as the wagon). The ropes were just long enough to allow the 4 x 4 hardwood to lie on the ground. On this plank a strong ring about 3 feet from either end was fixed. This plank was then hung on hooks from the hay frame and was carried all the time in that position, and the load was placed on top of the ropes lying in the floor. I had about 30 feet of ½-inch wire rope with a large hook at both ends. This rope passed through a pulley block which evened up the pull to the 4 x 4 plank and to the hook of the pulley block. Another wire rope with a tractor D on the other end was attached; this second rope was about 45 feet long, long enough to pass over the pits comfortably.

Plate 222.
Another view of the tractor train in action. Note the extension rim on the rear wheel of the tractor.

The Harvest.

Six men were all that were needed at any time after we started. The poles on the corn binder and grain binder were altered so that they were pulled behind the tractor.

The tractor and binder with two men cut a quantity of the crop, while the other four men carted with the truck. When enough for about a day's carting had been cut the tractor was hooked on to the two wagons, drawn one behind the other—the second wagon being pulled by a wire rope direct from the tractor and passing under the front wagon. All six men then loaded these two wagons and they were pulled to the edge of the line. (Plates 221, 222, 223.)

Plate 223.
Tractor and two wagons, showing rope attachment to the second wagon, and also a 4 x 4 board extending from the wagon frame.

The tractor was then unhooked and taken to the other side of the pit and hooked on to the D on the wire rope. The 4 x 4 beam was dropped on to the ground, the wagons being pulled in so that they dropped on the side away from the pit. The wire rope with the hooks on either end was passed over the load and the hooks put in the rings on the 4 x 4 beam. The tractor then moved slowly away from the pit and the load was rolled off into the pit. The same method was used to unload the other wagon, it was unnecessary to separate the wagons and they were in position to be hooked straight on to the tractor after the loads were off. (Plates 224, 225, 226.)

Plate 224.
Tipping the load into pit by tractor power.

To prevent the wagons from being rolled over into the pit, two 12 feet lengths of 3 x 2 wire passed into the undercarriages of the wagons and two men sat on the ends of each plank. (Plate 226.)

To simplify the rolling of the loads, we always loaded the wagons with the sheaves running longwise. With the heavy green crop we got good loads on without any sign of their falling off. The tractor then pulled the wagons back to the paddock for another two loads. Five men went with the wagons and one stayed at the pit to level off the loads just tipped in. We found that with a good crop and the pit not too far from the paddock that five men could get two loads (about 6 tons) every 45 minutes. In this time, the man at the pit could have the previous two loads spread. Of course, it was not necessary to move all the sheaves in the spreading when we had unloaded for the full length of the pit from one side; when that had been done, we pulled the wagons in on the other side, but heading in the opposite direction. It was only necessary then to carry the wire ropes across the pit and by unloading from both sides we found that it helped to keep the material level, so that it would sink evenly.

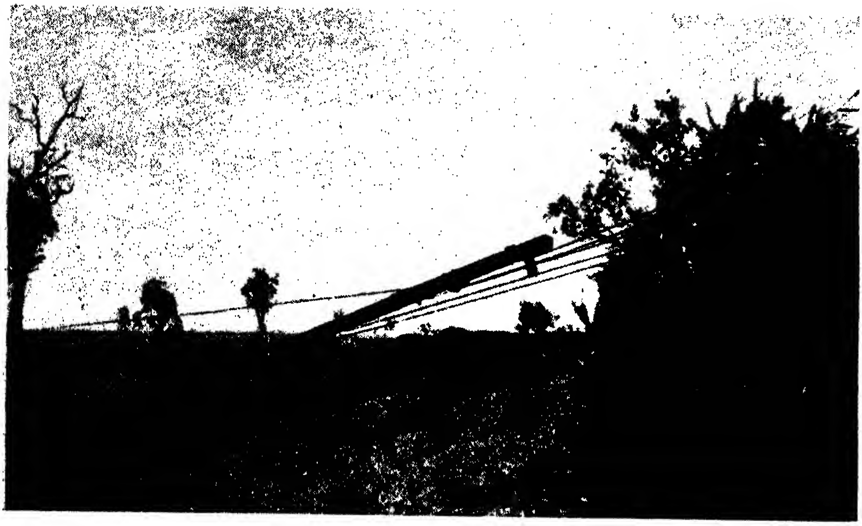


Plate 225.
Another view of the tipping operation.

The pits were filled until the material was 3 feet above ground level and solid. We then ran the tractor with the extension rims up (Plate 222) and down the pit to press the material down further.

Scooping from either side, about 2 feet of soil was placed on the heap and the top finished off with a camber like a graded road. As the soil settled in the pit, more was scooped on top to preserve the camber of the covering and the run-off for rain.

Plate 226.
Off-loading. The weight of the two men sitting on the sprag rails keeping the wagon on an even "keel."

In harvesting the corn binder will only cut crops set in rows, but is capable of putting through very heavy crops and will work to a height of 14 feet. The grain binder is limited to crops about 8 or 9 feet high and will take a cut of about 3 feet wide in a crop going 15 tons to the acre. (See Plate Nos. 227 and 228). With a few simple alterations it would be possible, it is thought, to make it handle crops up to 10-12 feet high.

Excavation Cost.

Costs, including wages for two men at 10s. a day, worked out at 7d. a cubic yard. This also included kerosene and oil, but not

Plate 227.
Grain binder in a 15-ton-to-the-acre saccaline crop up to 9 feet high.

depreciation on tractor or scoop. We averaged 250 cubic yards per day. It would of course be cheaper and quicker with a crawler tractor and would also be cheaper again with shorter pits as there would not be so much travel for each load. The Department of Agriculture advise that 1 cubic yard holds half a ton of ensilage so that the pits cost 1s. 2d. ton capacity. The pits are really improvements as they should last for many fillings with only a small amount of cleaning out before each filling.

Harvesting Cost.

The harvesting outlay included cost of ropes, forks, twine, repairs, and alterations, all of which were written off completely, although they were far from worn out. I included the depreciation on binders and scoop at 25 per cent. which is really excessive. The tractor costs were taken at 25s. per day, and as we only used 10 gallons of kerosene this should be ample. The wages were 10s. a day for each man, without keep. The cost worked on this basis was 4s. 4d. per ton which included covering over the first time. Since then we have spread a little more earth on the pits when they sank, but only took two days to top up all the pits.

We have now finished off the last pit and consider it should be safe there for years, if not wanted in the meantime. In all, 1,200 tons of ensilage have been stored this year and it is regarded as an excellent insurance against drought.

Plate 228.
Grain binder.

Any farmer with grown-up sons would, of course, be able to cut these costs considerably, for most of the expense was for labour, all of which was hired. My own wages were put down at 10s. when arriving at these costs.

Most farmers would probably use horses for at least part of the work; this may reduce the costs, but on the other hand it might slow the work down so that the costs would be as high if not higher. Such details would of course have to be determined by each individual farmer for himself, but whatever the costs, my experience has confirmed a belief that the method of fodder conservation described is not only practicable but highly profitable, especially from the drought insurance point of view.

Indian Hemp, Opium Poppy, and Coca Leaf.

THE plants known as Indian Hemp (*Cannabis sativa*), Opium Poppy (*Papaver somniferum*), and Coca Leaf (*Erythroxylon coca*), have been declared noxious weeds under the Local Government Act. So far as we know, they have not become established as weeds in Queensland, but they are all a source of important drugs. For this reason the plants have been defined as pests by the Secretary for Health and Home Affairs (the Hon. E. M. Hanlon). Their cultivation is an offence under the Act. The Government Botanist (Mr. C. T. White) has supplied the following descriptions and notes:—

Indian Hemp (*Cannabis sativa*).

The Indian Hemp is a robust plant, 3-10 feet high. The bark is very fibrous. The leaves are composed of 5-7 slender leaflets radiating out from the base like the fingers of a hand. The individual leaflets are 3-6 inches long and ¼-1 inch wide. Male and female flowers are borne on distinct plants. Both are insignificant. The plant bears an abundance of small seed-like nuts, about ⅛ inch long. Indian Hemp is

Plate 229.
Cannabis sativa (Indian Hemp).

widely cultivated in tropical and sub-tropical countries. It is probably more extensively grown in India than anywhere else. Its principal use is for the fibre produced from the inner bark. The gum or resin is an important drug, like opium it produces in small quantities an agreeable form of intoxication. It acts upon the nervous system producing hallucinations and afterwards lethargy. It is an official drug and the medicine is used as a sedative in madness and hysteria. It is also used in deadening pain.

* Three plants declared noxious throughout Queensland by *Government Gazette* issued on 22nd October, 1938, p. 1706.

Opium Poppy (*Papaver somniferum*).

The Opium Poppy is a robust annual plant, 3-4 feet high or more. The stems and leaves are of a pale-bluish or whitish-green colour. The leaves are large and coarsely toothed. The flowers are large, red, pink, or white. The centre of the flower is occupied by a large number of stamens, usually white, in the centre of which is the ovary, surmounted by 8-15 stigmas. The seed-capsule is about the size of a child's fist, and

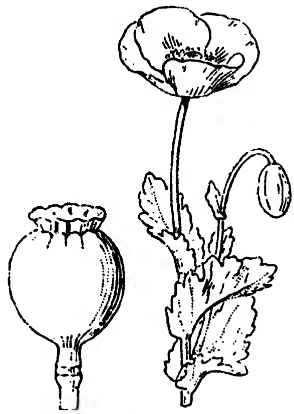


Plate 230.
Papaver somniferum (Opium Poppy).

contains a very large number of small rounded seeds. Several double-flowering varieties are cultivated as garden annuals. The Opium Poppy is a native of Asia Minor, but is now cultivated in many tropical and sub-tropical countries, particularly India and China. The resin obtained by scratching the seed-capsules is the source of opium, the principal constituent of which, from a medicinal point of view, is the alkaloid morphine.

Coca Leaf (*Erythroxylon coca*).

Coca Leaf is a shrub 6-8 feet high or more. The leaves are of a rather thin texture, oval in shape. The characteristic feature is that

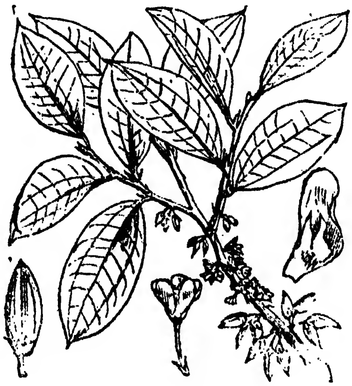
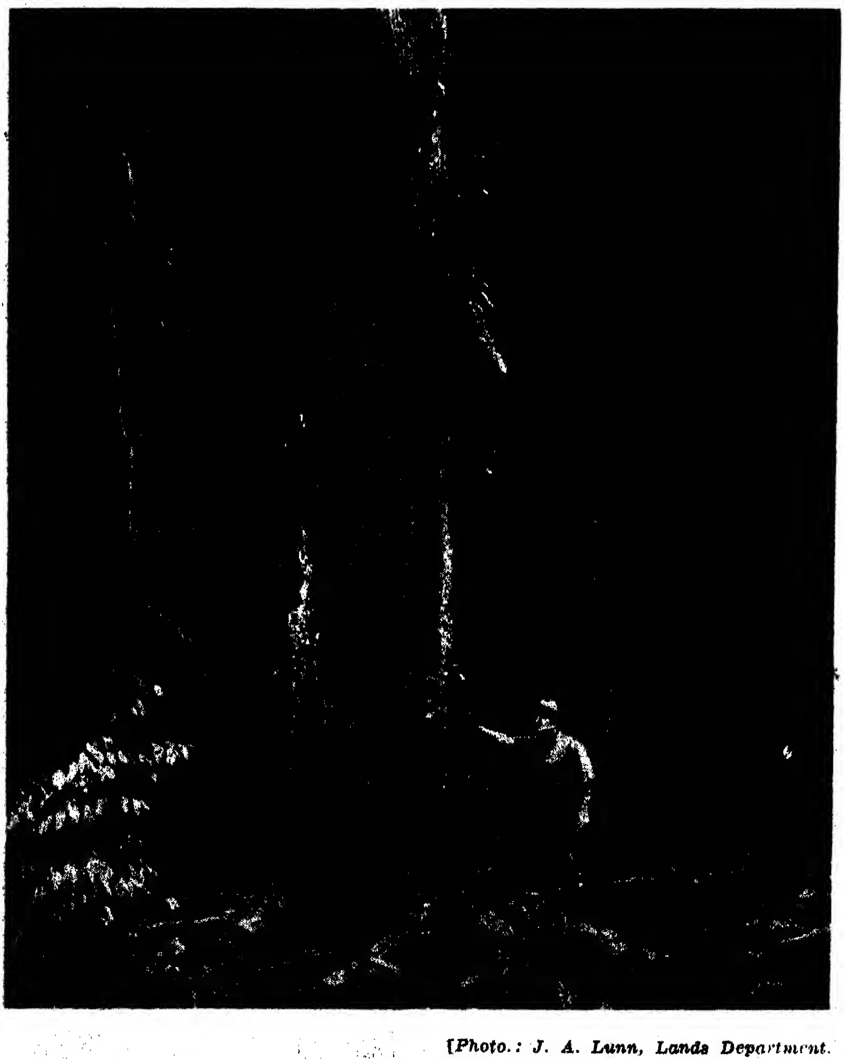


Plate 231.
Erythroxylon coca (Coca Leaf).

two of the veins, in addition to the midrib, run parallel with the margin. The flowers are small, white, and are produced in little clusters, mostly in places where the leaves have fallen away. The fruit is about ½ inch long, pointed at the top and surrounded at the base by the persistent calyx. It is red, with a scanty flesh, and contains a single seed filling the whole fruit. Coca Leaf is a native of South America and is very extensively grown in many South American countries. It is now scarcely known in the wild state. The leaves contain a crystalline alkaloid, cocaine.



[*Photo.: J. A. Lunn, Lands Department.*

Plate 232.

A GIANT OF THE JUNGLE.—On the edge of a road clearing through the rain forest at Danbulla, North Queensland.

Lime for Agricultural Purposes.

F. B. COLEMAN, Officer in Charge, and R. A. TAYLOR, A.A.C.I., Inspector and Examiner, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers and Stock Foods Investigation Branch.

UNDER *"The Fertilisers Act of* 1935," lime for agricultural purposes is dealt with very comprehensively.

The classification set out in the Act with respect to the types of lime for agricultural purposes is as follows:—

(1) Burnt lime, caustic lime, or quicklime—consisting chiefly of lime in the form of calcium oxide (CaO); or

(2) Slaked lime, air-slaked lime, mild lime, hydrated lime—consisting chiefly of lime in the form of hydrate of lime ($CaOH_2$) and/or carbonate of lime ($CaCO_3$), obtained by the slaking of burnt lime; or

(3) Processed lime—consisting of a by-product from a process—chiefly lime in the form of hydrate and/or carbonate of lime; or

(4) Pulverised limestone, marble, coral, or shells—consisting chiefly of lime in the form of carbonate of lime ($CaCO_3$) obtained by crushing or pulverising; or

(5) Earthy lime—consisting chiefly of lime in the form of carbonate of lime ($CaCO_3$) obtained by excavation of the natural substance; or

(6) Gypsum—consisting of lime in the form of hydrated sulphate of lime ($CaSO_4.2H_2O$).

The classification of lime, as shown above, is based upon terms in common use, which describe the process of preparation or manufacture to which the limes concerned have been subjected.

In order to fully understand the article, it is necessary to note that 56 per cent. calcium oxide—or lime (CaO) as it is commonly known—is equal to 100 per cent. calcium carbonate ($CaCO_3$); this may be explained by saying that 56 tons of pure burnt lime, containing 100 per cent. lime (CaO), is equal to 100 tons of pure limestone, containing 100 per cent. calcium carbonate ($CaCO_3$).

As lime (CaO) is present either free or combined with other elements, in all limes for agricultural purposes, it is used as a unit of measurement by analytical chemists in order to evaluate these materials.

Thus, pure limestone is not stated on analysis to contain 100 per cent. calcium carbonate ($CaCO_3$), but to contain 56 per cent. lime (CaO) as or in the form of calcium carbonate.

A description of limes for agricultural purposes and matters dealing with their origin, composition, and value are dealt with below.

BURNT LIME.

Burnt lime is obtained in the following way:—Limestone is first quarried and broken into fairly small pieces. These pieces are placed in alternate layers in a kiln with fuel—in Queensland usually wood—which is ignited. The heat serves to liberate the carbon dioxide from the calcium carbonate, leaving calcium oxide and a quantity of impurities proportionate to the purity of the original limestone.

Pure limestone would contain 56 per cent. lime (CaO) and 44 per cent. carbon dioxide; pure burnt lime would contain 100 per cent. lime (CaO) actually in the form of calcium oxide. In actual fact the minimum purity of good burnt lime can be accepted as 90 per cent. lime (CaO). It should be emphasised that the impurities mentioned above, consisting of iron, alumina, magnesia, silica, &c., are naturally present in limestone, and cannot without great expense be removed; moreover, in normal proportions they do no harm and can be disregarded.

It is essential that the limestones should be completely burnt, otherwise the purchaser is buying some of the original limestone at the price of burnt lime.

In this connection it may be mentioned that limestone (or coral) can only be completely burnt in a properly constructed brick kiln; "open-kiln" burning as practised in the past (consisting of logs built round the broken material) is not successful in giving a complete "burn."

An analysis of burnt lime indicates whether the limestone has been completely burnt; even if the burnt lime has been partially slaked it is still possible to determine this, providing the sample analysed is representative of the bulk.

In addition, a physical examination of badly burnt lime reveals in the resultant product "cores" of unchanged limestone which will not break down on slaking.

Burnt lime slakes under normal atmospheric conditions, taking in carbon dioxide and water from the aid and "altering" from calcium oxide to a mixture of calcium hydroxide and calcium carbonate. This slaking may be considered in two steps:—

At first the calcium oxide alters to calcium hydroxide and calcium carbonate, with calcium hydroxide in much greater proportion than calcium carbonate.

An analysis would show, say—

50 per cent. lime (CaO) as calcium oxide.
30 per cent. lime (CaO) as calcium hydroxide.
4 per cent. lime (CaO) as calcium carbonate.

When the whole of the oxide has "altered," the proportions of the hydroxide and carbonate would be represented by, say—

0 per cent. lime (CaO) as calcium oxide.
60 per cent. lime (CaO) as calcium hydroxide.
10 per cent. lime (CaO) as calcium carbonate.

This slaked lime would then gradually "alter" until it becomes all carbonate, an analysis revealing, say—

55 per cent. lime (CaO) as calcium carbonate.

This is then a stable article, and undergoes no further change under atmospheric conditions.

Following on the above, it may be assumed that an analysis of—

50 per cent. lime (CaO) as calcium oxide,
30 per cent. lime (CaO) as calcium hydroxide,
4 per cent. lime (CaO) as calcium carbonate,

represents a well-burnt lime that has partially air-slaked.

An analysis such as the following, however, would indicate by the excess of calcium carbonate, compared with calcium hydroxide, the presence of unburnt calcium carbonate, and consequently could be assumed as being a partially-slaked, badly burnt lime:—

50 per cent. lime (CaO) as calcium oxide.
7 per cent. lime (CaO) as calcium hydroxide.
22 per cent. lime (CaO) as calcium carbonate.

Of course the following—

70 per cent. lime (CaO) as calcium oxide,
0 per cent. lime (CaO) as calcium hydroxide,
16 per cent. lime (CaO) as calcium carbonate,

is obviously a freshly-prepared, badly burnt lime.

It must be noted that the percentages given are *calcium oxide* (CaO)—not calcium hydroxide ($Ca(OH)_2$) or calcium carbonate ($CaCO_3$).

When a farmer realises that burnt lime slakes even under normal atmospheric conditions, and its percentage of calcium oxide (CaO) and its neutralising value become lower, it is easy to see that burnt lime should be packed and railed as *freshly burnt* material. If the material has started to slake before being packed and weighed, the purchaser is buying and paying freight on partially slaked lime, which, as above stated, has a lower percentage of lime (CaO) and lower neutralising value.

Thus, a person who pays for burnt lime and asks the manufacturer to slake it for him, unless he gets the *increased "weight equivalent"* of slaked lime, is losing badly on the proposition; in any case he is paying freight on carbon dioxide and water that could be added to the burnt lime on his own property.

Burnt lime should be purchased on the basis of net weight at the place of burning—which in North Queensland is usually some distance from the coast—as, during transit to the coast, an increase in weight could occur (due, as above stated, to taking up of carbon dioxide and moisture) before weighing; if weighed at the coast this increase would be included in the net weight charged for. In other words, 10 tons of burnt lime at the kilns could weigh 11 tons on the coast, with a consequent increased cost to the purchaser.

Ground Burnt Lime is, as its name indicates, burnt lime that has been pulverised by machine without first slaking. One such product is now being offered for sale in Queensland.

The farmer in this case must weigh the additional cost of the material against any advantage in fineness, taking into consideration the facts that although he can easily slake unground burnt lime on his own property, there is no additional freight cost (as with slaked lime) involved with ground burnt lime, providing it is bagged and railed immediately.

Of course the fine state of division would accelerate slaking considerably, and this would not be apparent from appearance—as the original material is already in a fine state.

Packing in water-proof paper bags (similar to cement bags), however, eliminates any disadvantages that may normally be associated with such an active substance in transit, storage, or handling.

SLAKED LIME.

This may be of two main types:—Air-slaked lime and hydrated or water-slaked lime.

Air-slaked Lime.—This, as mentioned above, is obtained by exposing burnt lime to the slaking effects of the atmosphere. An explanation of the action has been set out previously.

The slaked lime made by farmers from burnt lime is usually air-slaked lime, that is, the burnt lime is dumped in heaps on the field, allowed to break down, and then spread and worked in.

The proportion of calcium oxide present and the forms in which it occurs at the time of application to the soil vary with the progress made in the process of slaking; this, of course, causes complications with respect to the amount of lime to be applied.

If burnt lime is purchased, the purchaser should apportion the lime actually applied to the soil into the same number of units as he planned for the original burnt lime.

For instance:—

A farmer buys 10 tons of burnt lime with a neutralising value of 160, planning to apply $\frac{1}{2}$ ton per acre to 20 acres.

When slaked ready for use the total weight may have increased to, say, 12 tons with a neutralising value of $133\frac{1}{3}$—which figure was, of course, reduced from 160 by the slaking.

The neutralising value will be *reduced* by the slaking.

The lime should still be divided into twenty lots and applied as planned, but the actual weight per acre will now be $\frac{12}{10} \times \frac{1}{2} = \frac{12}{20}$ ton $=$ 12 cwt. instead of 10 cwt.

The actual weight of lime (CaO) applied to the soil will be the same, however.

This is demonstrated thus:—

10 cwt. x neutralising value 160 $=$ 1,600
12 cwt. x neutralising value $133\frac{1}{3}$ $=$ 1,600

The neutralising value bears an approximate ratio to the lime (CaO) percentage.

If burnt lime is emptied direct from the bags into heaps on the ground to which it is to be applied, any increase in weight, &c., need not be considered.

Hydrated or Water-slaked Lime.—A more rapid and effective method of slaking can be obtained by adding measured amounts of water to burnt lime; this produces a rapid chemical change, with evolution of heat, and results in a fine, even, white powder, termed hydrated or water-slaked lime.

With a correctly made water-slaked lime the amount of water added is about one-third of the weight of the original burnt lime. The resultant product should be practically all calcium hydroxide ($Ca(OH)_2$), and should give a minimum analysis of 70 per cent. lime (CaO) as calcium hydroxide.

Possibly owing to lack of experience in this method of slaking, and the necessity for careful control with respect to proportions, &c., in

order to obtain a consistent product, water-slaked lime for agricultural purposes is very scarce in Queensland.

To correctly manufacture commercially, an hydrating plant is necessary; to date only one such plant is installed for this purpose in Queensland.

Of course, although hydrated lime is more active and more water soluble than air-slaked lime, it gradually alters to air-slaked lime on exposure, changing in time from practically pure calcium hydroxide to practically pure calcium carbonate.

There is not much of any slaked lime sold in Queensland.

PROCESSED LIME.

In certain industries various forms or compounds of lime are used in chemical processes, and a resultant lime by-product is obtained. The common types of "processed" limes—as these are designated—are set out below.

Gas Lime.—In the ammonia-recovery process associated with the gas industry, burnt lime is used; the spent lime consists chiefly of calcium carbonate and hydrate together with certain impurities such as sulphides—when freshly run off. On exposure to sun and air, however, the material becomes practically all carbonate, while the impurities are oxidised to harmless compounds. A recognised lime for agricultural purposes is obtained after drying and grinding.

Carbide Lime.—In the manufacture of acetylene, calcium carbide and water are used, giving as a waste by-product—when fresh—lime chiefly in the form of hydrate.

This lime also needs to be exposed to the atmosphere, dried and ground. Obviously, after long exposure, carbonate would be formed.

This form of processed lime is, in Queensland, naturally limited in supply, and to date it has not been considered worth commercialising.

LIME CARBONATES.

Pulverised Limestone, Pulverised Marble, Pulverised Coral, or **Pulverised Shells** are the respective natural materials after treating by passing through a crushing or pulversing machine.

The percentage of lime (CaO) varies according to the purity of the original material; the lime is in the form of calcium carbonate. *Pulverised limestone* varies in quality, but, generally speaking, is a fairly high-grade source of lime. It must be ground in a pulverising machine, as is explained elsewhere under the heading of "*Fineness.*"

The degree of fineness is an important factor governing its value. The natural impurities usually present are chiefly magnesia, iron, alumina and silica.

Coral.—Coral lime can be obtained at low tide from reefs in the tropics by a process of quarrying aided by explosives.

It has in the past been loaded on barges, taken to the mainland, and pulverised; in certain cases it has been broken into pieces and burnt—vide "Burnt Lime."

A product of coral formations found in shallow water in certain parts of the sea bed along the Queensland coast is also used as lime for agricultural purposes. This is handled by dredging, and although fairly dirty in appearance, it may be made to analyse fairly high in lime content by selection, washing, &c.

The lime is all in the carbonate form, as in the original coral. As fairly large pieces of coral are present, drying and grinding are necessary.

Earthy Lime consists of lime carbonate which is in a naturally disintegrated or friable condition, and is dug out after removal of the "overburden." It is comparatively impure and of a softer nature than limestone. It needs very little treatment before being offered for sale; sieving is sometimes sufficient to obtain a satisfactory degree of fineness—to which importance should be attached.

The lime (CaO) content varies according to the purity of the material—as in pulverised limestone—and is wholly present in the form of calcium carbonate.

Earthy lime must always be ground and/or screened before being bagged ready for sale.

MAGNESIAN LIMES.

Magnesium or Dolomitic Lime Carbonates.—A number of natural limestone or earthy lime deposits contain an appreciable quantity of magnesia. When this type of material is marketed in Queensland the maximum percentage of magnesia (MgO) as well as the minimum percentage of lime (CaO) must be declared on the label for the information of the purchaser, who may decide from these percentages whether the product is suited for his particular purpose or otherwise. The neutralising value to which both the lime and magnesia contribute must be declared also.

Of course, practically all naturally occurring lime carbonates contain a small amount of magnesia.

Fineness is of the same importance with all of these carbonates.

It should be noted that the maximum percentage stated on the label refers to magnesia (MgO)—not magnesium carbonate ($MgCO_3$). This is comparable to the declaration of the percentage of lime (CaO) and not calcium carbonate ($CaCO_3$), as explained under "*Labelling.*"

The percentage of lime (CaO) and magnesia (MgO) together found on analysis must amount to at least 35 per cent.

GYPSUM.

Gypsum is a naturally occurring form of lime, and may be described as dihydric calcium sulphate ($CaSO_4.2H_2O$).

It is very little used in Queensland, and although it has a minimum lime content of 25 per cent., it has no actual neutralising value.

No material is registered in Queensland under this name.

MISCELLANEOUS LIMES.

From time to time limes for agricultural purposes are placed on the market that owing to the quality of the material used, or difficulties

involved in the process of manufacture or preparation, or other factors, do not compare with limes in the group to which they purport to belong.

In these cases they are classified as miscellaneous to allow purchasers to value them on their own merits apart from any group in which they would appear out of line.

NEUTRALISING VALUE.

The term neutralising value applies to all limes for agricultural purposes, except gypsum, and affords a means of comparison applicable to these limes.

It is a comparative figure which denotes the ability of the lime in question to neutralise acidity, which is one of the main purposes for which lime is used.

It is a figure ascertained practically, and would include any other carbonates or basic materials present.

The standard of comparison is 100 per cent. pure calcium carbonate, which would have a neutralising value of 100.

Comparative neutralising values would be:—

Burnt lime	160
Slaked lime	120
Pulverised limestone	90
Processed lime	86
Earthy lime	80

FINENESS.

With respect to lime sold for agricultural purposes, fineness is of importance with earthy lime, pulverised limestone, pulverised marble, and other pulverised carbonates, and also processed lime.

Magnesian limes are, of course, included here.

"Fine" means particles that will pass a sieve with apertures $\frac{1}{100}$ inch square.

The whole of the limes to which fineness applies must pass a sieve with apertures $\frac{1}{8}$ inch square.

Burnt lime is not affected by fineness, and the resultant slaked lime is also exempt from this provision.

Carbonates with equal neutralising values may be compared on a fineness basis.

The reason why fineness applies to earthy lime, processed lime, pulverised limestone, and other pulverised carbonates, and not to burnt or slaked lime, may be set down as follows:—

It has been repeatedly proved *that lime carbonates, unless in a fine state of division, are not rapidly absorbed by the soil, being insoluble in pure water and only slowly soluble in slightly carbonated water—that is, water containing carbon dioxide in small quantity.

* "Value of Different Forms of Lime," by Dr. H. W. Kerr and C. R. von Stieglitz, Farm Bulletin No. 6, Bureau of Sugar Experiment Stations.

The following extract from "Farm Bulletin No. 6," by Dr. H. W. Kerr and C. R. von Stieglitz—"The Value of Different Forms of Lime"—is not only well worth repetition but should be very carefully borne in mind by every lime purchaser.

> "Other things being equal, the finer the condition of the agricultural lime, the quicker will favourable results be obtained. Particles coarser than $\frac{1}{20}$ inch in diameter are practically worthless, and in a country where lime costs are so high the farmer should pay particular attention to this consideration."

Artificial grinding (or screening) is therefore necessary with these materials.

Burnt lime, however, is in large lumps when sold, and of its own accord breaks down on slaking—either artificial or natural—to a fine powder. This powder being usually largely hydroxide when applied, is fairly water-soluble, and is absorbed readily by the soil. Also, the fineness of the powder is greater than could be obtained by normal grinding processes.

No artificial grinding is therefore necessary, and a fairly uniform absorption by the soil is obtained from all burnt or freshly slaked limes.

The table at the end of this article sets out the various limes being offered for sale within the State.

GROUP NAMES.

The use of names indicating the groups to which the particular limes relate is of importance.

For instance, a purchaser uses the name "Burnt Lime." Now, providing names used are a correct indication, any burnt lime registered would have a neutralising value that should be associated with burnt lime, e.g., say, at least 160.

If he orders a pulverised limestone, irrespective of "specific designation," he would get a material with a neutralising value of, say, at least 90, and with earthy lime, say, 70 to 90.

In addition, with the use of the name "Burnt Lime," he can dispense with fineness, whereas, with pulverised limestones, earthy limestones, &c., he has two factors of importance—neutralising value and fineness.

In short, limes may readily be compared with other limes in their own respective groups, and the strict adherence to this grouping with respect to the names used on the labels is of importance in allowing this comparison to be easily made.

LABELS.

The method of labelling lime with respect to lime content (as indicated in the Table) is as follows:—

The percentage or percentages of lime (CaO) and the respective forms in which it occurs must be stated. This means that, with slaked limes or carbonates, not the percentage of calcium hydrate and percentage of calcium carbonate should be stated, but the percentages of calcium oxide—lime (CaO)—that are present in each of those forms.

Let us take a partially air-slaked lime for an example. This may consist actually of—

50 per cent. calcium oxide,

40 per cent. calcium hydroxide, and

5 per cent. calcium carbonate,

with, say, 5 per cent. impurities.

Now, in the calcium hydroxide and calcium carbonate, only the percentages of calcium oxide (CaO) can be called active constituents.

To compare with burnt lime containing, say, 90 per cent. lime (CaO), all as calcium oxide, this lime must be reduced to a common basis. In other words, to compare with a material that has lime present only as calcium oxide (CaO), the percentages of calcium hydroxide and calcium carbonate must also be reduced to the amount of calcium oxide (CaO) that they contain—the forms in which the calcium oxide (CaO) occurs being, of course, also stated.

Thus, the label would read—

50	per cent. lime (CaO) as calcium oxide
30	per cent. lime (CaO) as calcium hydroxide
2·8	per cent. lime (CaO) as calcium carbonate
Total 82·8	per cent. lime (CaO).

On this figure the material can then be compared with any other lime on a total lime (CaO) basis.

Of course, the neutralising value gives a definite method of comparison, but it includes magnesia and other neutralising material, and is a comprehensive figure only; also, of course, the neutralising value does not indicate the form or forms in which the calcium oxide occurs, and is of value only with respect to neutralising soil acidity.

It is provided by the Fertilisers Act that all limes for agricultural purposes shall be labelled in such a manner as to set out :—

The kind of lime;

The percentage of lime (CaO) and the form or forms in which it occurs;

The maximum percentage of magnesia (MgO) ;

The neutralising value;

The net weight;

The percentage of fineness (except in the case of lime which has been burnt) ; and

The name and address of the manufacturer or dealer.

The following sets out examples of labels :—

BURNT LIME FOR AGRICULTURAL PURPOSES.

When packed, lb. net.

90 per cent. lime (CaO) as Calcium Oxide.

Neutralising Value, 160.

(Name and Address of Manufacturer or Dealer.)

PULVERISED LIMESTONE FOR AGRICULTURAL PURPOSES.

When packed, lb. net.

50 per cent. lime (CaO) as Calcium Carbonate.

Neutralising Value, 90.

Fine, 80 per cent. Coarse, 20 per cent.

(Name and Address of Manufacturer or Dealer.)

EARTHY LIME FOR AGRICULTURAL PURPOSES.

When packed, lb. net.

45 per cent. lime (CaO) as Calcium Carbonate.

Neutralising Value, 80.

Fine, 65 per cent. Coarse, 35 per cent.

(Name and Address of Manufacturer or Dealer.)

MAGNESIAN EARTHY LIME FOR AGRICULTURAL PURPOSES.

When packed, lb. net.

43 per cent. lime (CaO) as Calcium Carbonate.

7 per cent. Maximum Magnesia (MgO) as Magnesium Carbonate.

Neutralising Value, 85.

Fine, 60 per cent. Coarse, 40 per cent.

(Name and Address of Manufacturer or Dealer.)

This article deals only with the legislation controlling the sale and quality (both chemical and physical) of the various limes for agricultural purposes, that are sold within this State.

Any information desired as to the actual use or application to the land for specific purposes should be directed to the other branches of the Department that are concerned.

SUMMARY.

The chief original source of lime for agricultural purposes in Queensland is limestone rock.

The principal kinds of lime derived from this are as follows:—

Burnt Lime.—This is made by burning lumps of limestone, and providing it is packed and railed when freshly burnt, is a "concentrated" source of lime. It is to the farmer's advantage to slake burnt lime on his own property. Unfortunately the distribution of slaked lime is a very disagreeable undertaking. Ground burnt lime allows the application to be made by machine in one operation eliminating most of the objections.

An average quality burnt lime should analyse—

90 per cent. lime (CaO) as calcium oxide, and neutralising value, 160.

Processed Lime is the resultant by-product obtained after burnt lime has been used in certain chemical processes; the lime (CaO) is chiefly in the form of carbonate.

An average quality processed lime should analyse:—

46 per cent. lime (CaO) as calcium carbonate, neutralising value, 86; fine, 50 per cent.; coarse, 50 per cent.

Pulverised Limestone is the original rock quarried and ground. An average quality material should analyse:—

50 per cent. lime (CaO) as calcium carbonate, neutralising value, 90; fine, 80 per cent.; coarse, 20 per cent.

Other important limes for agricultural purposes are:—

Earthy Lime, which is an impure form of lime carbonate that can easily be worked by digging, being softer than limestone, and usually requiring screening only. An average quality material should analyse:—

45 per cent. lime (CaO) as calcium carbonate, neutralising value, 80; fine, 65 per cent.; coarse, 35 per cent.

Magnesian Limes for Agricultural Purposes, which are pulverised limestones or earthy limes containing appreciable quantities of magnesia.

The maximum percentage of magnesia (MgO) as magnesium carbonate as well as the minimum percentage of lime (CaO) as calcium carbonate must be declared on the label, and this should be considered by the farmer with a view to the application of the material for particular purposes.

Efficiency of Lime for Agricultural Purposes.—Limes which have been burnt may be compared on a neutralising value basis only.

Other forms of lime may be compared within their own respective groups on a neutralising value and fineness basis, except where the percentage of magnesia is appreciable, when this must be treated as another important factor.

Labels should set out the—

Kind of lime,

The percentage of lime (CaO) and forms in which it occurs,

The maximum percentage of magnesia (MgO),

The neutralising value,

The net weight,

The fineness (unless prepared by burning),

The name and address of the manufacturer or dealer.

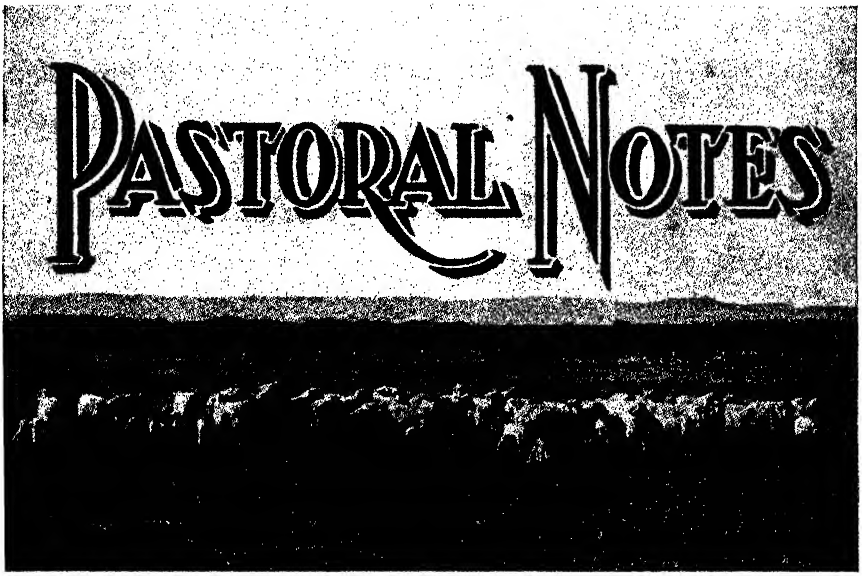
Buyers of lime of a greater value than 10s. should receive an invoice bearing the warranty required by the Act with respect to the quality of the article.

On no account should purchasers accept delivery of lime for agricultural purposes that is not labelled and invoiced in the manner outlined above.

All complaints or inquiries should be addressed to the Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch, Department of Agriculture and Stock, Brisbane.

Name and Address of Dealer.	Brand.	Guaranteed Analysis. Lime (CaO).	In the Under-mentioned Form.	Magnesia (MgO) as Magnesium Carbonate.	Neutralising Value.	Fine.	Coarse.
		Minimum %		Maximum %	Minimum.	Minimum %	%
Burnt Lime—							
Ambrose Lime Works Pty. Ltd., Ambrose	Ambrose	90	As oxide	..	160	..	..
Crotty Lime Works, Alma Den	Crotty	90	As oxide	..	160	..	..
Demehok, M., Mungana	Mungana	90	As oxide	..	160	..	..
Gore Lime Products, Gore	Gore	90	As oxide	..	160	..	..
Ryan Lime Co. Pty. Ltd., Townsville	Ryan	90	As oxide	..	160	..	..
Tamaree Lime Works, Tamaree	Tamaree	90	As oxide	..	160	..	..
Webb & Son, Reid River	Webb & Son	90	As oxide	..	160	..	..
Burnt Lime—Pulverised—							
Ryan Lime Co. Pty. Ltd., Townsville	Ryan	85	As oxide	..	150	..	..
Slaked Limes*—							
Hydrated—							
Gore Lime Products, Gore	Gore	70	As hydroxide	..	125	..	..
Air-slaked—							
Gore Lime Products, Gore	Gore	50 10	As hydroxide As carbonate	..	107	..	..
Tamaree Lime Works, Tamaree	Tamaree	60 3	As hydroxide As carbonate	..	110	..	..
Processed Lime—							
A.C.F. and Shirleys Fertilizers Ltd., Brisbane	A.C.F.	47	As carbonate	..	88	50	50
Australian Chemical Co., Brisbane	Acco	47	As carbonate	..	88	50	50
Barry & Roberts, Brisbane	Barry & Roberts	47	As carbonate	..	88	50	50
Michael, E. (Miss), South Brisbane	Processed Lime	47	As carbonate	..	88	50	50
Rose, M. G., Brisbane	Rose	47	As carbonate	..	88	50	50
Wynn, H. A., South Brisbane	A.C.F.	47	As carbonate	..	88	50	50
Pulverised Limestone, Marble, &c.—							
Ambrose Lime Works Pty. Ltd., Ambrose	Ambrose	50	As carbonate	..	90	84	16
Crotty Lime Works, Alma Den	Crotty	51	As carbonate	..	92	77	23
Fertiliser Distributers Pty. Ltd., Brisbane	F.D.L.	50	As carbonate	..	90	84	16
Gibbs, Bright & Co., Brisbane	S.C.	50	As carbonate	..	91	60	40
Gore Lime Products, Gore	Gore	50	As carbonate	..	90	38	62
Marberete Co. Pty. Ltd., Brisbane	Marberete	55	As carbonate	..	99	80	20
Robbins, W. G., Mowbray, Port Douglas	Robbin's	51	As carbonate	..	92	40	60
Ryan Lime Co., Townsville	Ryan	50	As carbonate	..	90	50	50
Earthy Lime—							
Bowen District Limes Pty. Ltd., Brisbane	Bowen	39	As carbonate	..	73	41	59
Bryant, C. J., Didcot	Didcot	47	As carbonate	..	80	74	26
Marmor Lime Co. Pty. Ltd., Mackay	Marmor	51	As carbonate	..	90	70	30
Ryan Lime Co. Pty. Ltd., Townsville	Ryan	45	As carbonate	..	80	50	50
Webb & Son, Reid River	Webb & Son	48	As carbonate	1	83	80	20
Magnesian Limes—							
Brett & Co. Pty. Ltd., Brisbane	Limil	42 15	As hydroxide As carbonate	5	110	85	15
Giffard, A. C., Inkerman	Giffard	45	As carbonate	5	85	60	40
Inkerman Lime Co., Inkerman	Inkerman	43	As carbonate	7	85	60	40
Metropolitan Lime and Cement Co., Brisbane	Curlew	21	As carbonate	21	78	60	40

* Also Limil—see Magnesian Limes.



Cattle Fattening.

THERE are large tracts of well-grassed land in South-Eastern Queensland on which fattening of bought store cattle is practised. These cattle are usually animals which fatten into "heavies." Older stock can "handle" roughage much better than yearlings, and it takes less time and trouble to get them ready for market; but, in general, they do not give as good a net return as "baby beef."

The reasons are:—

(1) Buying of stores is a more speculative business and the outlay greater.

(2) Disease, drought, and other retarding influences make the money loss, if any, greater.

(3) The trade does not favour "heavies."

(4) Although the relative cost per 100 lb. is higher with the "young stuff," more can be bought for the same money.

(5) The young animal lays on both flesh and fat—i.e., it fattens while it grows.

(6) The trade pays more for the finished carcase.

(7) There is *always* a market for well finished lightweights.

There are certain requisites for turning off baby beeves the year round:—

(1) On the part of the buyer, a sound knowledge of what "good doers" look like;

(2) On the property—well-planned subdivision, improved pastures, cultivation, and fodder conservation.

Improvements require a considerable outlay of capital, but in all cases where management has been sound the returns have made it well worth while.

It should always be remembered that the improvements are permanent, and that they enhance the value of the property.

CARELESS BRANDING.

Slovenly methods in the branding of stock, particularly cattle, are in evidence far too frequently, the results being most undesirable in many respects. Quite often the carelessness with which the branding irons are applied involves cruelty, although it may be unintentional.

It is cruel to hold the hot iron on an animal until the skin is burnt through, and it cannot be justfied on the score of necessity. This practice may be due to underheated irons, but, on the other hand, it may be due to over-hot irons held on the skin a fraction of a second too long, or with too much pressure. Such branding causes blotches, and very often the actual letters or figures are undecipherable. The skin in the area involved is ruined for tanning purposes, and festering sores may result. Identification of the animal by means of such a brand is rendered very difficult, if not impossible.

It is a well-known fact that, on large stations, where thousands of calves are branded yearly, and where speed is a factor in the handling of large mobs, the standard of branding is much higher than on some small holdings—such as farms, where only two or three calves may be branded at irregular periods.

FEEDING FARM HORSES.

It is not unusual to see a farm-hand pitchfork hay into a yard over which manure is thickly scattered. This is a source of risk and loss. Much of the hay is trampled into the dust or mud and rendered unusable. Ensilage, too, may be wasted in this way. A far greater, although more indirect loss to the stockowner, is caused by the contaminated feed. Many farm horses are infested with worms of various kinds, and dirty yards may teem with the parasites in their initial stages. These parasites get into hay, or other feed tossed on to the ground, and are swallowed by stock, often with disastrous results. Heavy mortality among farm horses has been traced to worm infestation, and owners should take every care in feeding their working animals. A rack or a trough ensures greater cleanliness and saves waste of good feed.

The Effect of Seasonal Conditions on Sheep Parasites.

SEASONAL conditions must be taken into consideration when attempting to protect sheep against likely losses from blowfly strike. During the winter, rains were fairly frequent in many localities, while mild weather was the general experience. These conditions were generally conducive to a heavy fly infestation in the spring.

Where rain has occurred during the spring, the resultant warm, moist conditions may be regarded as favourable to a big increase in flies. Fresh green vegetation, which has since sprung up, is likely to cause scouring in flocks in localities in which those conditions are prevailing. Graziers who have benefited by the spring rains may, therefore, expect trouble amongst their sheep with wool sufficiently long and, probably, dirty.

To treat the odd sheep in a flock is only putting off the evil day, and much greater benefit will follow the effective treatment of the whole mob. Shearing is a great protection, but as this is only an annual job, the long interval between shearings must be considered. In places where dipping for lice and ticks is necessary, it has—if a good arsenical mixture is used—a most protective effect on the sheep, besides killing many of the flies. Dipping, from this point of view, is most satisfactory when the sheep are carrying at least six weeks' growth of wool. Crutching is a sanitary and useful method likely to give some protection against fly strike, but, as it does not kill the pest, the protection will be of short duration in a bad fly season.

Jetting with a regulation ·8 per cent. arsenical mixture will not only protect the sheep from maggots, but also will destroy large numbers of flies which suck the poisonous moisture from the wool. Because of the strength of the mixture, the wool surrounding the usual places of attack will carry arsenic in sufficient quantity for some weeks to kill

any maggots which may be deposited after jetting. Jetting does not prevent strike, but will destroy the maggots before they do harm to the sheep. The important point is for the flock owner, where early storms are experienced, to apply his favoured method of protection to all his sheep as soon as convenient.

The same, seasonal conditions, and this year they are common to a large area of the State, are also conducive to an increase in internal parasites. The worms which usually cause trouble in a flock become numerous while the sheep are still doing well on fresh green feed. Consequently, the risk of pasture contamination is serious. When the grass becomes dry and less nutritious as the season advances, the wormy sheep will suffer severely, while heavy lamb losses may be expected. Early drenching for the control of stomach worms will do much to protect the sheep. Where necessary, drenching should be continued at monthly intervals until, say, next June.

—*Jas. Carew.*

SHEEP ON THE FARM.

Sheep should have a permanent place on any farm on which conditions are suitable. One of the advantages of sheep is that they provide two distinct sources of income annually—wool and mutton—besides their natural increase.

In Queensland, merino sheep constitutes about 97 per cent. of our total number. This breed is especially adapted to conditions in the central and western districts of the State, but when forced to breed and develop in an unsuitable environment, constitutional weakness is a real risk.

British breeds have been developed and maintained under conditions where environment has influenced adaptability to Queensland conditions. In mixed farming districts these breeds—especially the pure bred rams—can be used with advantage. The Corriedale originated in New Zealand and the improvement of the breed has been progressive, both there and in Australia. In Queensland, the Corriedale is regarded as a dual purpose sheep coming between the merino and pure British breeds, overlapping both in adaptability to a considerable degree.

In sheep breeding, local conditions should decide the system of production.

Sheep breeding under diversified farming conditions where the British breeds are used is entirely different from merino breeding in the West. The merino is bred under purely pastoral conditions, and the progeny is retained for wool and mutton production. With the imported mutton breeds, the aim of the farmer is to dispose of the progeny at the earliest marketable age. To do this successfully, two major points should be observed:—

(1) The use of pure bred rams of quick-maturing qualities suitable to location and conditions.

(2) Availability of suitable pasture or cultivated crops for ewes as soon as their lambs are dropped, and for topping off the lambs.

Other considerations of importance are the suitability of the ewe flock for wool production as well as for breeding; economy in pasturing the ewe flock from the time the lambs are taken off until the next drop of lambs; the general health of the flock and freedom from parasites; fodder provision for carrying the flock successfully through periods of scarcity; and culling the breeding flock for age while they are still capable of being fattened and sold at a profit. To start successfully in breeding, whether for wool, mutton, or for fat lambs, healthy sheep are essential. This may mean paying more for young sheep, but it will generally prove the best and safest policy.

—*Jas. Carew.*

MERINO TYPES TO SUIT COUNTRY AND CONDITIONS.

In merino sheep it is not always advisable, or even possible, to breed the type one would wish. To be successful, a farmer should realise that the type should be chosen to suit his country and local conditions. For instance, it should be obvious that the sheep carrying the clothing wools of Western Victoria would prove a failure in the western districts of Queensland.

In selecting a type, the first consideration should be constitution. In the West sheep frequently have comparatively long distances to go to water. A sheep then should be introduced that is fitted by nature to withstand this hardship. Judged from a financial point of view—and. after all, everything practical in the industry comes back to a matter of pounds, shillings, and pence—consideration should be given to the type of animal which gives the yield per head rather than price per lb.

Having evolved a type suitable to his particular conditions, it is important that the farmer should stick to the stud supplying the rams. It takes a man of experience in breeding to successfully maintain a flock while chopping and changing about from stud to stud.

Pay the price for the better-type rams and, if necessary, pay the right man to select them, having regard to the type of ewes with which they are to be mated.

—*J. L. Hodge.*

THE CORRIEDALE AS A FARMER'S SHEEP.

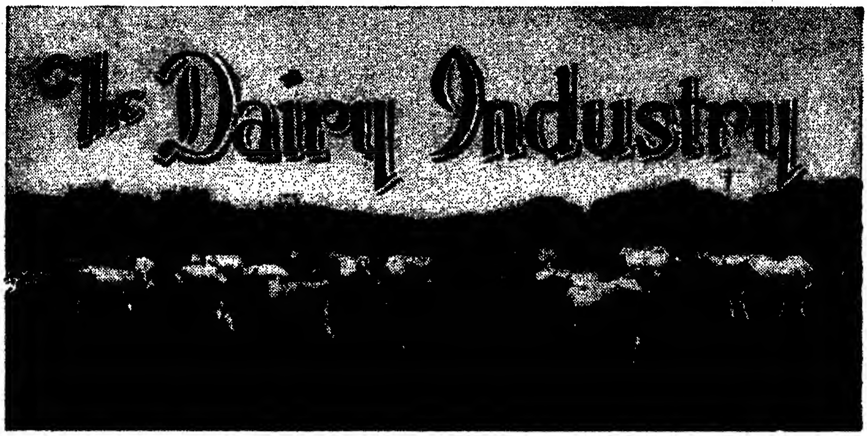
As an all round general utility farmer's sheep, nothing beats the Corriedale. There is no better ewe for the production of fat lambs. Joined with one of the Downs rams—such as the Dorset Horn or the Southdown—the lambs it produces are first class.

Corriedale ewes are docile, good doers, and great milkers.

In Queensland there is a tendency to breed the Corriedale too fine, thus defeating the object for which the breed was evolved.

No finer wool than a 56 counts should be tolerated in the Corriedale stud. To get the fleece as fine as merino counts can only be done at the expense of constitution, one of the Corriedale's most important characteristics. Growers of pure bred Corriedale sheep would be well advised to cull rigorously any animal showing too fine a tendency.

—*J. L. Hodge.*



Bobby Calves.

IF a substantial and lasting success in the development of a trade in veal is to be achieved, the greatest care must be given to methods of feeding, and the condition in which calves are marketed. The trade has already increased the income of the dairy farmer; hitherto it has been the practice on many farms of limited carrying capacity to kill all calves at birth.

Some farmers, unfortunately, have made a practice of sending calves to the meatworks as soon as they are born, and that accounts for the high percentage of condemnations, of which the principal cause is immaturity.

The milk of a newly-calved cow is fed to pigs and poultry, and therefore is not wasted, but it should be borne in mind that this milk would show a better return if fed to the new-born calf than if fed to pigs. The value of this milk is often not so much as a weight increaser as a preventer of weight loss. This is true of the larger breeds. With the smaller breeds its value is, of course, primarily for growth.

The law provides for a dressed weight of not less than 40 lb., and an age of not less than fourteen days.

Condemned calves are a direct loss to the farmer, and they also involve the meatworks in loss on account of wasted effort and loss of time.

Mature veal is a wholesome food article, while immature veal, which has a laxative effect on the consumer, is not allowed on the market for consumption.

This loss, due to immature calves, can be avoided if the calf is fed for a few days on its mother's milk. The calf should weigh 80 lb. or more before being sent to the meatworks. This live weight will give a dressed carcase of approximately 40 lb.

SOME CAUSES OF DIMINISHED DAIRY PROFITS.

It is a mistake to think that higher prices offer the only solution of the dairy farmer's problems. Increased and cheaper production per acre also is of importance. Better methods of management, and the cutting out of all waste can do much to make dairying profitable. Sick and low-producing cows are among the biggest charges in the profit and loss account of every dairy farm.

It is very important, too, to guard against disease infection—especially mammitis and other disorders that spread rapidly through a herd.

By isolation and careful management, it is possible to keep dairy stock diseases down to a minimum. A close study of feeding methods will help to keep a herd healthy and in good condition, and thus render the animals less liable to contract infectious or other diseases.

The unprofitable cow is one of the dairy farmer's worst handicaps, economically speaking. Frequently she is a cow that pleases the eye, yet deludes her owner into the belief that she is filling the bucket with the rest of the team. Each herd collectively must show profitable returns to the owner, otherwise he soon may be asking his bank for an overdraft. How many farmers can show that they are getting a profit from each cow in the herd?

It costs no more to own, feed, or milk, profitable cows, so it is obviously unwise to persevere with unprofitable ones. The adoption of herd recording, therefore, needs no argument to commend it.

A registered pure-bred bull of known production record is a decided advantage, and farmers who will persist with a bull of unknown quality are certainly risking heavy loss.

LUBRICATING THE SEPARATOR.

Before the separator is used, it should be seen that the sight feed lubricator is working satisfactorily. It is absolutely necessary for the machine to receive the correct flow of oil from the lubricator before the separation process begins, otherwise the spindle—one of the most expensive parts of the machine—will show signs of wear long before it is due. Ten drops of oil a minute is a satisfactory adjustment to make on the lubricator. Any increase in this number of drops will not help in the lubrication, although the oil will not go to waste, for it drops into the reservoir at the bottom of the machine.

As soon as separating is finished, the lubricator should be shut off to prevent any more oil from dropping into the machine.

It is advisable to form a habit of cleaning the working parts—the parts that have to be oiled—at the beginning of every month. Take

the back cover off the machine, drain out the oil, put in a cup of kerosene or petrol and give the machine a good turn, so that all the moving parts will be thoroughly cleansed. Drain off the kerosene or petrol in the same way as the oil, then replace it with clean, fresh oil, turn the machine again, so as to distribute the oil over the parts, then stop the machine and drain again. This will leave the separator in a thoroughly clean condition, ready to receive fresh oil that will give 100 per cent. lubrication.

Another important point to remember about separator lubrication is that the particular type of oil used must be suitable for high speed lubrication. Cheap, thick oil should not be used as it may reduce very considerably the efficiency of the separator.

The whole of the cleaning-out and renewing of the oil can be done well within half an hour and the time spent will be more than repaid.

REGULATION OF PRODUCTION.

The United States Government has found that it cannot constitutionally directly limit or regulate production, but it is tackling its farm problem from the angle of soil conservation, of which regulation of production is described as a by-product. Farmers who limit production through the soil conservation formula receive direct monetary grants from the Federal Treasurer as compensation. As the Australian Constitution is based largely on that of the United States, it is of interest to note that the State power in relation to the planning of agriculture has been upheld there.

The State of Califorina has problems similar to those of Queensland. At times there are inconvenient farm surpluses. The Government there has passed legislation which gives power to limit the quantity of produce offered for sale. This applies only when the majority of producers approve.

Similarly, in Canada there are constitutional difficulties. The Natural Products Act, designed to plan the production and marketing of natural products, has been found to be beyond the powers of the Dominion Government, as it interfered with the prerogative of the Provinces over production given, curiously enough, under section 92 of the Canadian Constitution. There seems to be a sort of fatality about section 92! On the contrary, the power of the Provincial Governments have been upheld quite recently. British Columbia has obtained the approval of the Privy Council for its own Natural Products Act, including the State power to levy production.

Britain, too, has its production problems and is no way behind in efforts to assist agriculture. Huge subsidies are granted from the Treasury, and almost every line of produce is now under some form of marketing control. This organisation is quite recent, for the first Agricultural Marketing Act was passed by the British Parliament as recently as 1931. In the case of hops and potatoes, there is a tendency towards placing commodities under commission control, but many marketing boards, with producers in the majority, still continue.

In other European countries the "home consumption price" has also been adopted. Its application is of particular interest in Holland and Denmark, which, with their dairy produce, compete with that of Queensland on the British market. Holland has taken complete powers to plan agriculture, despite the fact that the country's policy is traditionally free-trade. Denmark has its local price for butter—usually higher than the export price. Both countries regulate production of farming commodities where it is deemed necessary. France and Italy now limit their output of wine. Scores of similar instances of production control could be quoted. Even Baghdad has its Date Board!

It is interesting to recall that Queensland's primary producers' organisation and marketing legislation has had some influence on the passage of similar legislation in the United States, and, possibly, some other countries.

Size of Breeding Sows.

SIZE is an important feature in breeding pigs, yet some breeders do not give it sufficient consideration.

One of the chief objectives in pig raising is to get pigs to marketable weights in the shortest possible time. To obtain the desired rapid development and still have a finished pig with a light covering of fat, it is necessary to breed from pigs which are big within their class. That is to say, pork type breeding stock—such as Middle Whites—should be big animals of their category if their progeny are to grow quickly to porker weights. Bacon type breeding stock—such as Large Whites—also should be big of their type if their progeny are to develop similarly to baconer weights. The extreme bacon type of breeding stock could, of course, be used to produce fast growing porkers, but such porkers, under normal feeding conditions, would not be sufficiently mature to give good carcases at porker weights. Breeding pigs should be big within their type.

Size is inherited in pigs as it is in horses, and trying to grow a small type pig into an extreme bacon type is like trying to make a pony into a draught horse.

Observations lead to the belief that size within a breed is frequently lost through mating stock before they are sufficiently grown.

A large breeding sow, provided she is not too fat and clumsy, is more likely to produce a litter of large pigs and to be able to suckle them better than a smaller sow, under similar conditions.

Records of a large number of breeding sows show that sows which are mated when between nine and twelve months old are more productive throughout their breeding career than sows mated earlier or later.

Under Queensland conditions, it is common to see sows mated at five to six months old when they are barely bacon weight, but this practice does not give the sows a chance to develop and become productive mothers.

The best recommendation is to mate sows when they are about nine months old, or when they have reached a live weight of approximately 250 lb. In cases where sows are mated when very young, either by accident or design, they might be given a chance to develop by withholding them from service for some weeks after their first litter has been weaned.

—*E. J. Shelton.*

ROUNDWORM IN PIGS.

Frequently pig farmers ask for an explanation as to why their young pigs do not grow at a normal rate and do not reach bacon weight till, perhaps, about twelve months old. Some also state that losses among their young pigs have occurred at intervals over a number of years.

One of the chief causes of these troubles is a roundworm which is often found in large numbers in the small intestine. When a herd is infested the worms are frequently passed by the pigs, and as they may measure up to 15 inches in length, are easily seen in the dung in the sties. The animals become infested through swallowing an egg which contains a very minute worm. These eggs hatch in the small intestine, and the small worms to which they give rise burrow into the intestinal wall and are carried by the blood stream into the liver and lungs. The young worms then leave the lungs and crawl up the windpipe into the mouth. They are then swallowed, and so reach the intestine once more, and this time they settle down and grow to maturity. The presence of the young worms in the liver and lungs causes serious disorders which may cause death, usually from pneumonia. If the animal survives, it remains stunted and sickly, and may have a short, hard cough.

This worm is, fortunately, in a way, harmful only to animals under about four or five months' old, and in these young animals the effects of an infestation may be very prominent just after weaning.

The worms are easily removed with oil of chenopodium. Details of treatment with this drug may be had on application to the Animal Health Station, Yeerongpilly.

Treatment, however, should not be regarded as the only measure to be adopted for the control of this worm. Prevention of infestation is far more important, and this can only be ensured by strict attention to sanitation and other measures aimed at preventing the young pig picking up the worm eggs which are passed out in the dung. The regular removal of all manure, the maintainance of a high standard of sanitation in the sties and yards, and a paddock system of rearing go a long way to keep the infestation below the point at which it becomes harmful. Furthermore, the fact that pigs on a good balanced ration can fight more effectively against the evil effects of the worms than animals which are regarded as merely farm scavangers, should not be overlooked.

—*F. H. S. Roberts.*

RISK OF FEEDING RAW OFFAL TO PIGS.

On many farms a fat beast is killed occasionally for domestic use. Portions of the carcase and viscera are sometimes fed raw to pigs. These form a valuable pig food, if cooked; but, if fed raw the health of animals may be endangered. For example when an animal is affected with tuberculosis, the primary lesions in the organs, being small, may escape detection. Although the carcase may not be grossly affected, there is a real danger to pigs—especially young ones—if fed with uncooked material from a diseased beast.

Under the Cattle Slaughtering Act, the Diseases in Stock Act, and the Pig Industry Act, the feeding of any meat offal or blood to pigs, unless it is thoroughly cooked, is a serious offence.

SHADE FOR PIGS.

During the summer adequate shade for pigs should be provided. The ordinary sty, particularly if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If there are no trees near by, a wooden shed will answer the purpose.

Another important aid to the health and comfort of pigs is a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling itself. Unfortunately, the wallow sometimes seen on the pig farm is a filthy puddle-hole. If there is infection of any kind in the yard, it is to be found in just such a place. Dirty wallows should be drained and filled in, and a concrete or similar bath provided. This can then be kept clean, and the liability to infection will be diminished.

Comfortable and hygienic conditions are most important in maintaining the health and wellbeing of pigs.

—*E. J. Shelton.*

FEEDING SLOP TO PIGS.

Pouring wet hog feed all over one's shoes in trying to satisfy a lot of crowding, squealing pigs need not be a part of every day's work. A trough that will give the animals their swill without the usual mess, and that will save a great deal of feed and temper is shown in the illustration. It can be made from an old trough plus a piece of rain-spout and an old barrel or box. If the trough is made double, as shown, there will be much less crowding, and the feed will be distributed more evenly. A

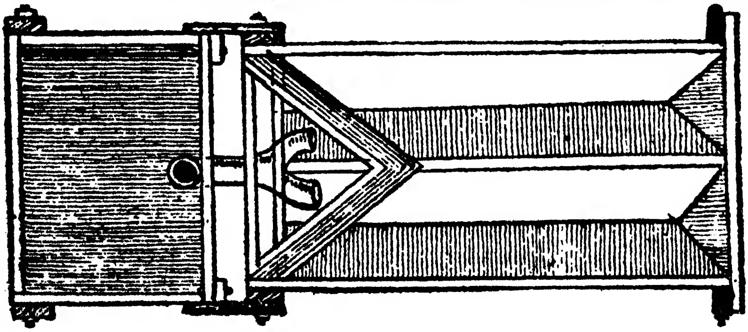
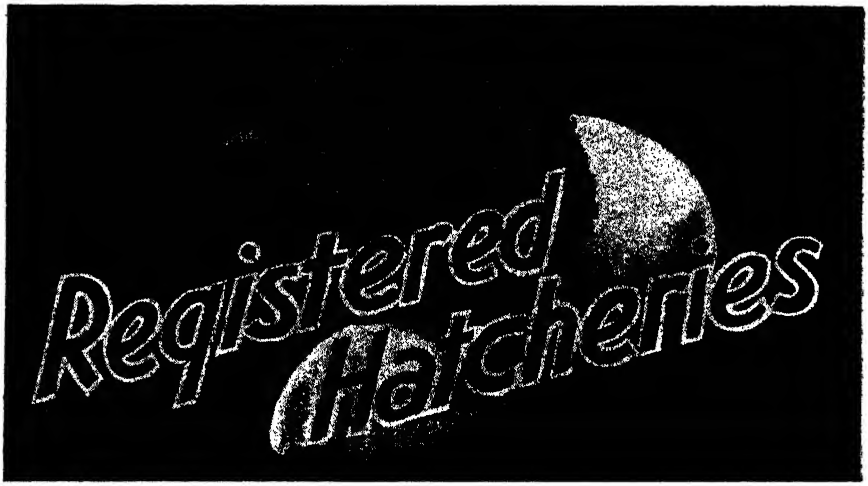


Plate 233.

piece of rain-spout with a Y at one end lets the swill down to the trough from the barrel or box in which it has been mixed. Each opening of the tube opens into one of the troughs and the openings are protected with a V-shaped guard made of boards. After the swill has been well mixed the plug is drawn from the bottom of the box, and the swill runs into each of the troughs, which can be made any length.—"Country Gentleman."



Registered Hatcheries.

FOLLOWING is a list, giving the names of the owners of hatcheries registered up to and including 31st December, 1938:—

Name and Address.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertiro	White Leghorns, Australorps, Rhode Island Reds, and White Wyandottes
F. J. Akers, Eight-mile Plains	Elmsdale	White Leghorns and Australorps
J. Cameron, Oxley Central	Cameron's	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
J. L. Carrick & Son, Manly road, Tingalpa	Craigard	White Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
T. G. Crawford, Stratford	Rho-Isled	Rhode Island Reds
Rev. E. Eckort, Head street, Laidley	Laidley	Australorps, White Leghorns and Langshans
Elks & Sudlow, Beerwah	Woodlands	Australorps and White Leghorns
W. H. Gibson, Manly road, Tingalpa	..	White Leghorns and Australorps
Gisler Bros., Wynnum	Gisler Bros.	White Leghorns
J. W. Grice, Loch Lomond	Quarrington	White Leghorns
C. & C. E. Gustafson, Tannymorel	Bellevue	Australorps and White Leghorns
F. J. Lambert, Acacia Vale, Townsville	Lamberts	Australorps and White Leghorns
J. McCulloch, White's road, Manly	Hindes Stud Poultry Farm	White Leghorns, Australorps, and Brown Leghorns
A. Malvine, junr., The Gap, Ashgrove	Alva	White Leghorns and Australorps
H. L. Marshall, Kenmore	Stonehenge	White Leghorns and Australorps
W. J. Martin, Pullenvale	Pennington	Australorps, White Leghorns, and Black Leghorns
J. A. Miller, Racecourse road, Charters Towers	Hillview	White Leghorns

Name and Address.	Name of Hatchery.	Breeds Kept.
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
F. J. Mottram, Ibis avenue, Deagon	Kenwood Electric Hatcheries	White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshams, White Wyandottes, Sussex, Rhode Island Reds, and Brown Leghorns
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
E. E. Smith, Beerwah	Endcliffe ..	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview ..	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns
P. A. Wright, Laidley	Chillowdeane ..	Brown Leghorns, White Leghorns and Australorps
R. H. Young, Box 18. P.O., Babinda	Reg Young's ..	White Leghorns, Brown Leghorns and Australorps

SOME POINTS IN POULTRY MANAGEMENT.

In poultry farming, culling serves two important purposes. By getting rid of the culls, all of the feed goes to the laying hens; and only the best hens remain in the flock to serve as future breeding stock.

Other sound points in poultry farming include care in the handling and marketing of eggs. Eggs are considered to be one of the best of foods, yet in spite of that fact the quantity consumed by Queenslanders (estimated on an annual per capita basis) is extraordinarily low. Why more eggs are not eaten is probably because their regular dietary value is not more widely appreciated. There are other reasons, too; for instance, the delivery of dirty-shelled eggs and the production of fertile eggs in hot weather. Clean nests, clean floors, and clean containers will soon overcome the dirt difficulty; while selling off all the male birds at the close of the hatching season is the answer to the other problem. Eggs should be gathered two or three times daily, and marketed at least twice weekly in hot weather.

In looking after poultry, even with the best of care, we often overlook a very common source of trouble, and that is the house fly. Flies can go a long distance and carry germs and contamination from a diseased flock, or from microbe-infested filth. The industrious pullet will chase and catch flies just for the fun of it, and, at the same time, take in all sorts of germs or worms. So it would be wise to clean up every attraction for flies and spray the fowl houses just before cleaning them out. For general health reasons, apart from the requirements of the fowl run, it pays handsomely to swat the fly.

CARE OF GROWING PULLETS.

Any special attention or care given to pullets during their growing stage will be well repaid by greater production when they come into profit.

The main points in management which ensure profitable pullets are:—Perching early, separation of sexes, small units, feeding, and sanitation. Pullets should be taught to perch as soon as possible after they have been removed from the brooder. The earlier they become accustomed to perching, the more they spread at night. This prevents crowding and ensures a good air supply for all.

The separation of sexes as soon as the males can be distinguished, gives them a much better chance of making good development. Small units also assist in their development and decreases the percentage of stunted pullets, which is the usual result when large numbers are housed together. It is advisable not to house more than 100 pullets in any one unit.

Feeding also is important. The ration should be correctly balanced and the birds given as much food as they will eat. The birds should be given as much mash as they will consume in about 20 minutes; if they require more, it should be supplied. It is advisable to give two meals of wet mash, one early in the morning and the other at midday.

In no circumstances should wet mash be left lying about as it sours rapidly and puts the birds off their food. Dry mash hoppers should be kept well filled and always open. The feeding troughs of both systems should be long enough to provide ample feeding space. Lack of sufficient feeding space is a very common error in dry mash feeding. At least 1 foot of space should be allowed for each ten birds.

Green feed may be supplied with the midday meal, unless the birds have access to a well-grassed run. Wet mash should form the bulk of the midday meal, unless the dry mash method is used. In dry mash feeding a small quantity of mash mixed with the greens will tend to increase the consumption of greenstuff. As an evening meal, the pullets should be given as much grain as they will consume.

Clean, cool, fresh water should always be supplied daily, and the drinking vessels should be kept in a shaded position.

Coarse sand, shell grit, and charcoal should always be available and kept in suitable containers. Each of these materials has an important influence as an aid to digestion and assimilation of food, and is, therefore, invaluable in maintaining health in the flock.

Sanitation also is important and covers the regular cleaning of pullet pens. Wet patches should not be allowed to surround the drinking vessels, and the treatment of perches with creosote to prevent an invasion of blood-sucking parasites should not be overlooked.

—*J. J. McLachlan.*

PROTECT EGGS FROM MOULD.

Under humid summer conditions, eggs are more prone to decomposition than at cooler periods of the year. This is not because of the effect of the climate on the egg itself, but because of the rapidity with which mould growths develop during warm weather. If it were practicable to prevent the egg coming in contact with moulds, decomposition of the egg from this cause would not occur.

If fowl yards are allowed to become littered with straw, dry grass, and similar material, mould spores will develop abundantly. Consequently, the poultry farmer is advised to clear away all rubbish, and do all that he can to prevent the development of moulds.

Dampness in any degree is conducive to the rapid growth of moulds, consequently every precaution should be taken to ensure that the nesting material is dry and clean, and that the eggs and fillers used for packing them are dry.

Two recent examples of how easily the quality of eggs may be depreciated are cited:—In one case it was found necessary, because of a muddy poultry run, to wash every egg. The washing was well done, stains were removed with an odourless sandsoap, and the eggs were clean when packed; but, unfortunately, they were packed in strawboard fillers, with a slight bead of moisture on the shell. In the course of two days, when these eggs had reached the market, quite a number of rots had developed. As the poultry farmer concerned had a reputation for marketing good eggs, the agent retained the eggs that were apparently good on arrival for a further two days, but, on testing, many more rots were found.

The second case was that of a farmer who had well-grassed runs for his fowls. Although nests were provided, many of the hens nested in the grass. Complaints as to the quality of the eggs were received by the agent to whom these eggs had been consigned, with the result that the next consignment to reach the floors was carefully candled. Candling disclosed a number of rots. Eggs which were in apparently good condition were retained on the floors for another two days and again candled, when more rots were revealed. This led to an investigation by the Department of Agriculture and Stock, when it was found that only the eggs that had been laid in the grass were affected, and that the rottenness was caused by mould growths which had gained access through the pores of the shell. Providing the hens with more clean nests and so discouraging them from laying in the grass corrected the trouble.

These examples indicate how easily the quality of eggs can be affected, and that it is essential—particularly during hot, humid weather—to protect eggs from decomposition caused by moulds.

—*P. Rumball.*

MARKETING TABLE POULTRY.

To obtain the highest returns, it is necessary to market table poultry in the best possible condition. The term condition covers the state of the feather, flesh, and age of the bird. If culling of the layers is given the attention that it should, little can be done to improve the returns from culled hens.

Experiments have indicated that the flesh carried by a well-fed hen that has finished egg production cannot be increased economically by extra feeding, because the hen that has lost weight through regular laying takes too long to respond. The best practice, therefore, is to market culled hens before they become a mass of pin feathers. This condition applies particularly about this time of the year.

The right marketing of cockerels is of particular importance. This class of fowl sells reasonably well at any stage of development, if it is sold before it reaches what is known as the "staggy" stage. This term is applied to birds commencing to show spur development. To obtain the maximum value for cockerels for table purposes, they should be sold while the spur is still in the bud stage. Many breeders keep cockerels until this stage has passed, and, consequently, do not get top prices.

In the marketing of cockerels, it is well to examine the feather growth. Cockerels with a lot of pin feathers do not dress attractively. This applies particularly to birds such as the Australorp, because of the colour of the plumage. Pin feathers on white feathered birds are not so noticeable.

Again, certain breeds are not well-fleshed at all times. This applies generally to the bigger birds—such as the Light Sussex and the Rhode Island Red.

To summarise—poultry raisers with cockerels to market should, firstly, bear in mind the fact that birds with indications of spur development do not realise the maximum value; secondly, that the rate of development of cockerels from twenty to twenty-four weeks of age is not as great as that which takes place earlier, consequently any increase in body weight is at a greater cost; and, thirdly, that it is undesirable to market cockerels carrying a lot of pin feathers, and those that are scraggy and not well fleshed.

—*P. Rumball.*

BLACK COMB DISEASE IN FOWLS.

Black comb disease in poultry occurs frequently throughout the State from October to March. It usually affects laying hens, and is responsible for heavy losses to the industry either by death or decreased egg production.

Where treatment is prompt the mortality does not appear to be as extensive as when treatment has been delayed. Again, early treatment appears to assist in getting affected birds back into production much more quickly than when it has been deferred.

The first indication of the disorder is a bird's pronounced loss of appetite, followed in the course of a few hours by a darkening of the comb. In fact, it is not uncommon for 25 per cent. of the flock to have a very darkened comb within 24 hours of the first sign of the trouble.

In the early stages of this disease the temperature of sick birds rises. This induces thirst. As the disease develops, little desire for water is in evidence, and as treatment for this trouble is given by means of the drinking water, the necessity for prompt action is obvious.

On further examination of the sick birds, it will be found in most cases that the crop is full, an indication of the suddenness of the attack. This condition of the crop has caused many breeders to attribute the trouble to the food and water. As the disorder advances the legs of the Leghorns particularly become very much darkened in colour; and if the feathers of a bird of any breed are turned back, the skin will be found to be darker than usual. Diarrhœa has been observed in some cases, but it is not apparent in all affected flocks.

The mortality from this disorder appears to be governed largely by the general condition of the flock, and the rapidity with which treatment is applied. Where prompt measures have not been taken, losses have been as high as 20 per cent.; but where early treatment is given deaths have been as low as 1 or 2 per cent. The loss from deaths, however, is not the only important factor. Egg production has been observed to fall from 60 to 5 per cent. within six or seven days.

Treatment.—Several proprietary mixtures are used with apparently beneficial results, but in preference to deferring treatment until these mixtures are procurable, the breeder is recommended to administer Epsom salts to the birds in the drinking water at the rate of 1½ to 2 oz. to the gallon.

—*P. Rumball.*

GRASS INVESTIGATIONS.

Depending on pastoral production so much as we do—most of our wealth comes from grass—in fact grass is our best crop—the value of pasture investigations and improvement has long been realised. In Queensland we are becoming particularly active in this field, and included in the work now in hand are:—

- Top-dressing of natural pastures.
- The sowing down of pastures with mixtures of species adapted to specific climatic and soil zones.
- Development of improved strains of the more valuable species.
- Pasture management involving rotational grazing and conservation of surplus fodder.

In general, however, these developments have been restricted very largely to regions of fair to heavy rainfall.

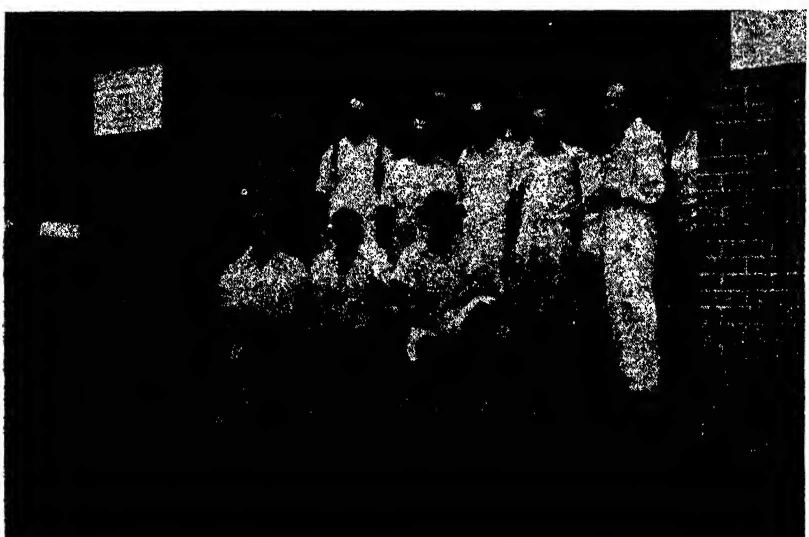


Plate 234.
The Staff of the Esk Butter Factory, Brisbane Valley.

Agricultural Notes

Lucerne Hay.

BALED lucerne hay or lucerne chaff, and maize grain are now recognised as among the bases of supplementary or drought feeding, if the fodder has to be transported over long distances. Increased attention is, therefore, being given to the production of good-quality lucerne hay. Good hay containing 45 per cent. to 50 per cent. of leaf will always command a good price, while a weathered or sweated consignment will be hard to sell.

Very careful handling is required from the time lucerne is cut until it is stacked or baled for market. Prime lucerne hay should be green in colour, dry, free from weeds or rubbish, and should contain a high proportion of leaf. Prevailing climatic conditions are naturally an important factor, and, whenever possible, cutting should commence in bright, fine weather. Lucerne should be cut shortly after the first flowers have appeared, when numerous young shoots will usually be observed at the base of the crowns. When the plants are allowed to become over mature, actual loss of weight and feeding value occur, as leaf will be lost, and the stems will harden, thereby becoming largely indigestible. It is customary to commence mowing in the morning, as early as possible, after any heavy dew has evaporated. During fine, hot weather, raking may commence about midday. Raking into windrows should, if practicable, be completed by nightfall as much leaf may be lost if the lucerne is left too long in the swath. After wilting for a few hours in the windrows, fork into high narrow cocks which encourage the natural transpiration of moisture better than if broad flat cocks are made. If rain occurs the lucerne will require turning to prevent the formation of mould, but during fine, hot weather it is possible to stack within two days of cutting. Excess moisture will induce mould, and possibly combustion in the stack, while if the lucerne is allowed to become too dry, it will lose appreciatively in palatability, weight, and appearance. Before carting, the stems should be tested by twisting them between the hands, when any excess moisture will become evident.

Wherever possible, lucerne hay should be stored in sheds, but if it becomes necessary to stack it in the field, a framework of logs should be laid down, care being taken to keep the centre of the stack high

during building. Large stacks which are likely to be held for some years may be protected by thatching or by a temporary galvanised iron roof.

Proximity and accessibility to the chief markets is obviously an important factor in the profitable production of lucerne hay for direct sale.

GRASS HAY IN THE MARANOA.

On many Maranoa properties a start in storing excess grass may now be made. If any surplus of nutritious grass is not cut soon, it will mature and lose much of its feeding value.

Excellent hay can be made from common native grasses—such as love grasses, early spring grass, and star or windmill grasses. Where good stands exist on cleared areas—such as old cultivation paddocks and creek flats—and a mower and rake are available, the grass can be conserved at little cost and will prove of value when natural feed again becomes scarce.

The grass cures very quickly and, in most cases, should be in the stack the day after cutting. Harvesting is, consequently, a relatively simple operation. The palatability and keeping qualities of the hay may be improved by sprinkling the several layers with a small quantity of salt as stacking proceeds. The merits of this cheap method of fodder conservation are realised by many farmers and graziers, but its more general adoption is warranted in view of its dual advantages of elimination of waste of good feed and inexpensive provision of fodder reserves.

—*C. H. Defries.*

GOOD SEEDS.

Although nearly everyone will agree that better seeds mean better crops, it must not be overlooked that better cultivation means better seeds.

Seeds to be good must have a high germinating capacity, be true to variety name, and free from weed seeds, inert matter, and disease or insect infestation. No matter how careful the grower may be, all crops will contain some plants other than those which it is intended to produce. A cleaning machine should, therefore, be used before the seed is offered for sale. In Queensland, as in every other part of the world, the most critical buyers will be found among the merchants with efficient cleaning machinery.

A modern seed-cleaning plant can make good samples of uncleaned seeds better, but it cannot make bad samples good. With a full knowledge of their machinery possibilities most merchants are willing to buy on a clean seed basis. They are not, however, inclined to purchase poor samples, and the usual market for seeds of indifferent quality is with dealers who have little appreciation of impurities. The actual seed user who insists on buying his supply on a price rather than on a quality basis encourages the vendors of goods of inferior quality. Unfortunately, seeds of indifferent quality usually carry a large profit to the seller.

Good seeds cost money to produce and money to clean, and the general improvement of farm seeds rests largely with the farmers themselves. When practically every farmer insists on a high-grade product the demand for poor-quality seeds will cease. Only the best-quality seeds are worth buying.

Horticultural Notes

Marketing Bananas.

DURING hot weather, bananas which have been cut and left exposed to the sun for only a short period soon become quite unfit for sale, and the pulp is eventually reduced to a soft, "boiled" condition. Cutting should be done in the early morning, before the heat becomes severe, and care should be taken to keep the fruit covered completely, even from the early morning sun, while waiting to be carried or wired to the packing shed.

The fruit should at all times be handled with the greatest care—in fact, the less it is handled the better—and for this reason it is wise to have the packing shed right in the plantation, if possible. On cutting the bunch it should not be laid carelessly at the foot of the stem, which usually means it rests on a bed of sticks and dead weeds. A bed of leaves is easily and quickly formed if the bunch must be set down in the plantation, although a better plan is to carry it straight into the shed or to the end of the wire and there place it upright on bags or trash with the stalk leaning against a rail provided for the purpose. In this way possible damage will be reduced to a minimum.

On being dehanded, the fruit should be allowed to "drain" for a few hours. Packing immediately after dehanding sweats the fruit in the case and makes bruising much easier. Care should be taken to ensure that fruit which is "sprung" or in the early stages of ripening is not packed, as it will quickly be reduced to pulp and be unsightly in a case of otherwise sound bananas. No fruit should be packed for Southern markets from bunches in which some of the fingers are already showing colour indicating ripening. The fruit should be dehanded just at the collar joining the fingers to the main stalk. The most suitable knife for this work is one of a sharp, flexible, and very narrow type.

There is a right and wrong way to separate the hands into singles, if a "single" pack is desired. Tearing the bananas apart endways often peels part of the skin from the fruit and also bruises the stem,

thus setting up an entrance for organisms which cause blackend. The correct method of separating into singles is to grasp the cluster firmly with both hands at the stem end, then twisting one hand forwards and the other backwards, the fruit is separated easily and without any damage to the stalk end.

On completion of packing the cases should be packed on their sides in a cool, shady position to await transport to rail or market.

Should it be desired to use the "cluster" pack, the same method should be adopted, separating three or four instead of the single finger. If a cluster of three or five is used, a single banana should be added to make it a four or six. The secret of clusters is to have the fruit in twos, or multiples of two up to six. Very even types of fruit will sometimes pack in clusters of eight.

—*Jas. H. Gregory.*

A SEASONAL REMINDER TO BANANA GROWERS.

With a change to warmer seasonal conditions following the recent good rains, an increase in the incidence of bunchy top may be anticipated in all districts where this disease is known to exist. Growers, therefore, are advised to spare no effort to keep infection down to an absolute minimum.

Banana-growers in districts where bunchy top is present are advised to patrol their respective plantations at least one day a week, examining each plant in every stool for symptoms of the disease. Every plant showing signs of infection and every plant with which it is vegetatively connected should be immediately kerosened and afterwards destroyed in the proper way.

Plants infected with the disease will be recognised by an absence of the downward curl of the tip of the leaf, with the blade turning hard back against the mid-rib, then abruptly curling out again, whilst its outer margin is somewhat wavy and chlorotic (i.e., loss of green colouring) in appearance. A closer inspection of the leaf of an infected plant will reveal the dark-green, Morse-code-like streakings running horizontally across the blade between the fibres, turning abruptly down into the amber line running up either side of the mid-rib. The amber line in a leaf taken from a healthy plant will be devoid of the green streaking.

The recommended method for the control of bunchy top is as follows:—Pour down the central foliage of each bunchy-top-diseased plant, and each plant with which it is vegetatively connected. at least ½ pint of pure kerosene. Within twenty-four hours remove from the soil the corms of all such diseased plants and cut the corms into pieces not more than 2 inches in any diameter.

By patrolling their respective areas each week, growers will keep bunchy top infestation within reasonable control on their own plantations and lessen the infestation throughout their districts, while, at the same time, materially assist in preventing the spread of this disease to unaffected areas.

Too much emphasis cannot be placed on the need for giving effect to the foregoing recommendations if complete control is to be maintained over this disease.

—*J. McG. Wills.*

LADY FINGER BANANAS—CULTURAL METHODS.

The fruit of the Lady Finger variety of banana has a very pleasant flavour, its keeping qualities are good, and it is always in demand.

Alluvial flats with a subsoil of free clay suit the variety best, but it can be grown successfully on hillsides of even contour where the rainfall is copious and regular, and where shelter is provided from heavy winds.

Thorough preparation of the soil is necessary, and where possible it should be worked to a depth of at least 12 inches. Healthy butts at least nine months old, with a minimum diameter of 6 inches, are the best planting material. On the loamy flats, the distance apart should be 18 feet by 16 feet, with three followers; on hillsides and other less favoured sites, 15 feet by 15 feet, with two followers.

To prepare for planting with two followers, the butt should have about 2 feet of the pseudo stem left and all visible eyes or buds gouged out with the exception of two which should be on opposite sides. The same method is adopted for three followers, except that three buds are left spaced equally round the butt.

Two, or, as the case may be, three suckers will appear in a short time after planting, and these are allowed to grow, but all other growth must, for at least nine months, be removed as soon as convenient after it appears above the soil. After the selected suckers have made two-thirds of their growth towards maturity, giving them a height of approximately 8 feet, a follower can, under favourable conditions, be selected on each plant in a straight line away from the parent plant and left to form the fruiting material for the second crop. The growth habit by which successive suckers may be selected in a straight line away from the original plant will persist for the life of the plantation, and all other growths should be removed as soon as possible. By careful attention to this and other cultural methods, maximum returns can be expected and realised.

Periodical applications of fertilizer, when the soil is of average fertility, will have beneficial results.

Cultivation should be shallow to avoid destroying the root system.

The planting of Mauritius beans down the centre of each row at a distance of 30 inches between plants would ensure a good mulch during hot summer weather and considerably retard weed growth.

Covering of the fruit with a suitable material, as advocated for Cavendish and Mons Marie varieties, during their maturing periods amply repays the grower.

—*H. J. Freeman.*

THE AFTER CARE OF GRAFTS.

Any deciduous fruit trees which have been grafted this season should be examined from time to time, and when the growth is about 8 inches long the wax cloth and string should be cut through with a sharp knife to allow for expansion; otherwise the string will cut into the bark and ruin the graft. Many grafts are ruined each year because of growers omitting to do this necessary work.

When cutting, first cut through the wax cloth and string only; do not remove the wax cloth. The scion will push it off, and until then it serves a very useful purpose in protecting the cut surface of the limb from the sun and spores of fungus diseases.

Many fungus diseases are what might be called wound parasites, and an unprotected cut surface is an easy place of entry for them.

Do not allow shoot growth from the stock to overcrowd or rob the scions, and when checking any such growth, note whether any grafts have failed; if so, thin out the shoot growth so as to allow two or three shoots to develop sufficiently and in the right place, so that they can be budded to take the place of the dead graft.

The best time for the budding of these shoots will be from the end of January to the middle of February. The shoots to be budded must be making growth, or else there will be no sap flow to form the union.

The buds should also be taken from the current season's growth, and from shoots that are still making growth. The buds should be cut from about the centre of the shoot, as they will prove more satisfactory than those taken from near the base or tip.

—*H. St. J. Pratt.*

MARKETING PASSION FRUIT.

With the coming of warmer weather, passion fruit growers should exercise greater care in the harvesting of their fruit. Fruit should not be allowed to fall from the vines as fallen fruit quickly becomes crinkled, reducing its size and value to the retailer. By picking the fruit when it is showing half colour its marketing life will be greatly increased, and its selling value raised. Where a grower has a percentage of crinkled fruit, it should be included with marked and blemished fruit and packed separately from the uncrinkled fruit. While most retailers have no outlet for crinkled fruit, there is, however, a good market otherwise for fruit of this description.

All fruit should be carefully handled and packed on the diagonal system, which gives the fruit the maximum of protection and display value, thereby enhancing its general appearance.

—*J. McG. Wills.*

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

THE stone fruit season is now in full swing; cherries, peaches, plums, and apricots are now making their appearance in increasing quantities on the market. Remembering the troubles of oversupply of these fruits usually experienced during the December holidays, one is tempted to ask what will we do about it this year? If the problem is to be solved, now is the time to evolve something. There is no doubt that the thousands of people at holiday resorts cannot easily obtain supplies at reasonable prices. Investigations over a number of years confirm this. Whilst glut conditions have ruled in the markets retail prices at the seaside have remained too high for people with large families. Cheaper fruit would help greatly towards clearing the markets of oversupply. It should not be difficult to organise a scheme. The recent strawberry and pineapple distribution campaigns have indicated what can be done. Extra publicity on the part of all concerned in the industry soon cleared the markets, prices firming to payable levels. Some nice pineapples from Magnetic Island have come to hand, and have sold at top market price.

With early consignments of cooking apples from the Granite Belt to hand growers are advised not to send small, immature fruit to the market. It will lower values for apples as the season advances, creating a handicap which will be hard to overcome.

Mangoes have increased in supply. Small and bruised lines are now hard to sell. Growers are warned against sending common varieties to Southern markets, where only best types are saleable.

Good quality papaws are selling well, although at present there are too many lines of inferior fruit. Local papaw growers do not appear to make any effort in producing a better type of fruit. Destroying trees which consistently carry poor type, hard, soapy, or soft, flavourless fruit would be a start towards improving the quality of fruit on the market, and would go a long way towards the elimination of the wide range of prices noticed on the market.

Growers in the deciduous fruit districts are advised to get their packing sheds ready for the coming season. Machinery should be conditioned, pits dug, and picking equipment mended and sterilised. Care in doing this will greatly assist in reducing the incidence of brown rot.

Oranges are still selling at moderate prices, small fruit still being hard of sale.

Bananas have eased slightly in price. Quality fruit is easy to dispose of at satisfactory prices.

Pineapple growers' attention is drawn to the complaints of water blister in Southern markets. Only careful handling, plenty of wood wool padding when packing and a clean packing shed will help to reduce this trouble. Benzoic acid assists to control the trouble, but its efficiency must be assisted by carrying out the above precautions.

Prices during the last week of November were:—

TROPICAL FRUITS.

Bananas (Cavendish).

Brisbane.—Smalls, 4s. 6d. to 6s. 6d.; sixes, 5s. to 9s.; sevens, 7s. to 11s. 6d.; eights and nines, 8s. to 13s.

Sydney.—Sixes, 6s. to 10s.; sevens, 11s. to 14s.; eights and nines, 15s. to 17s.

Melbourne.—Sixes, 8s. to 11s.; sevens, 10s. to 13s. 6d.; eights, 11s. to 14s.; nines, 13s. to 15s.

Adelaide.—17s. to 18s. per case.

Pineapples.

Brisbane.—Smoothleaf, 7s. to 10s. per tropical case, loose, 2s. to 8s per dozen; Roughs, 8s. to 11s. per tropical case, loose, 3s. to 7s. 6d. per dozen; Northern Roughs, 9s. to 12s. per case.

Sydney.—Smoothleaf, 10s. to 16s. per tropical case.

Melbourne.—Smoothleaf, 10s. to 15s. per case. Many lines affected with water blister.

Adelaide.—Smoothleaf, 16s .to 18s. per case.

Papaws.

Brisbane.—Yarwun, 5s. to 7s. per case (tropical); Gunalda, 3s. to 4s. per bushel case; Choice locals, 2s. 6d. to 3s. per bushel case; second grade, 1s. 6d. to 2s. per bushel case and hard of sale.

Sydney.—8s. to 12s. per tropical case. Inferior, lower price and hard to sell.

Melbourne.—6s. to 9s. per tropical case.

Mangoes.

Brisbane.—Townsville, 6s. to 7s. per bushel case. Small and bruised fruit hard to dispose of.

CITRUS FRUITS.

Oranges.

5s. to 8s. 6d. per bushel case.

Lemons.

Locals, 6s. to 9s. per bushel case; Specials higher, to 13s.

Grape Fruit.

Palestine grape fruit are selling on the Melbourne market at 40s. per export case (1¼ bushel). This should indicate to local growers the prices which can be obtained for quality fruit.

DECIDUOUS FRUITS.

Apples (Southern).

Brisbane.—The quality of imported apples is rapidly falling off, and quality new season's fruit will be welcomed. Jonathan, 9s. to 14s. 6d. per bushel case; Granny Smith, 12s. to 16s. per bushel case; Sturmer, 6s. to 11s. per bushel case; Tasma or Democrat, 10s. to 14s. per bushel case; Crofton, 11s. to 14s. per bushel case; Yates, 9s. to 15s. per bushel case; Stanthorpe cookers, 14s. to 16s. per bushel case.

The warning expressed last month to select hard varieties of quality for shipment to Brisbane is repeated.

Pears (Southern).

Brisbane.—Winter Cole, 12s. to 17s. per bushel case; Winter Nelis, 10s. to 14s. per bushel case; Broom Park, 9s. to 14s. per bushel case. All fruit should be wrapped.

Peaches.

Stanthorpe Mayflower, 4s. to 9s. per half-bushel case; Sneyd's 3s. 6d. to 5s. per half-bushel case; Local China Flats, 2s. to 4s. a tray.

Plums.

Wilson, 10s. to 12s. per half-bushel case; Early Gem, 3s. to 4s. per half-bushel case; Greengages, 6s. to 8s. per half-bushel case.

Apricots.

Warwick, 4s. to 9s. per half-bushel case.

New South Wales, 6s. to 12s. per half-bushel case.

Cherries.

New South Wales, 5s. to 8s. per tray.

Stanthorpe, 5s. to 7s.

OTHER FRUITS.

Passion Fruit.

Brisbane.—8s. to 10s. per half-bushel case; second grade, 5s. to 7s.

Sydney.—Queensland, 8s. to 14s. per half-bushel case.

Melbourne.—Queensland, 14s. to 20s. per half-bushel case.

Tomatoes.

Brisbane.—Coloured, 2s. to 4s.; green, 1s. 6d. to 4s.; ripe, 1s. to 3s.

Heavy supplies have been maintained since the second week of the month, which caused prices to fall to the above levels. Poor quality fruit should be kept off the market, which would help in its recovery.

Sydney.—2s. to 4s. per half-bushel case.

MISCELLANEOUS VEGETABLES, &c.

(Brisbane prices, unless stated otherwise.)

Pumpkins.

Brisbane.—4s. to 5s. per bag.

Sydney.—8s. to 10s.

Marrows.

Brisbane.—6d. to 1s. 6d. per dozen.

Sydney.—3s. to 4s.

Water Melons.

Small, 3s. to 9s.; large, 12s. to 22s. per dozen.

Cantaloupes.

4s. to 5s. per bushel case.

Lettuce.

Brisbane.—9d. to 2s. per dozen.

Sydney.—2s. to 4s.

Cabbage.

Locals, 9d. to 2s. per dozen; Stanthorpe, 3s. to 4s. per chaff bag.

Beans.

Brisbane.—3s. to 5s. sugar bag.

Melbourne.—2d. to 6d. per lb.

Peas.

3s. to 5s. per sugar bag. Inferior, lower price.

Beetroot.

2d. to 4d. a bundle.

Rhubarb.

6d. to 1s. per bundle.

Live Stock in Queensland.

THE following tables show the numbers of horses, cattle, sheep, and pigs in Queensland at 1st January, 1938, as compiled by the Government Statistician from stock returns. Comparative figures for 1937 and 1938 are given in the first table for horses, cattle, sheep, and pigs in statistical divisions of the State. Detailed information for cattle and sheep in petty sessions districts is given in the second table.

The statistical divisions consist of twelve groups of petty sessions districts, the first five representing South Queensland, the next three Central Queensland, and the remaining four North Queensland. In each of the three cases the statistical divisions are arranged in order from the east coast to the west.

HORSES.

Horses have shown an increase for the first time since 1922. The total declined steadily each year from 747,543 in 1922 to 441,536 in 1937, but the figure of 446,777 for 1938 shows an increase of 5,241 or 1.19 per cent. compared with the previous year. The Central Western, North-Western, and Edgecumbe Divisions registered increases of 4, 3, and 2 per cent., respectively, and most of the other divisions showed small increases.

CATTLE.

Generally herds declined in the south-western corner of the State, and in the dairying districts of the south-east and far north, while throughout the centre and central coast beef herds showed some increase. The net result was that the total number of cattle remained practically steady at 5,959,165, compared with 5,950,572 in 1937—an increase of 8,593. Increases were recorded in the North-Western, Central Western, Port Curtis, Maranoa, and Edgecumbe Divisions, but these gains were largely offset by decreases in all the other divisions of the State. The North-Western Division showed an increase of 44,354, or 5 per cent.; Central Western 24,526, or 6 per cent.; and the Port Curtis, Maranoa, and Edgecumbe Divisions registered increases of 2, 4, and 1 per cent., respectively. The greatest decrease was experienced in the South-Western Division, where the total declined by 31,787, or 18 per cent. The Petty Sessions Districts of Thargomindah, Augathella, Cunnamulla, and Quilpie, in this area, showed decreases of 12, 15, 29, and 29 per cent., respectively. The adjoining Petty Sessions Districts of Boulia, Diamantina, and Windorah, in the far western area, showed decreases of 30, 11, and 12 per cent., respectively. Most of the petty sessions districts in the dairying divisions of Moreton, Downs, and Wide Bay registered slight decreases.

SHEEP.

The 1938 total of 22,497,970 shows a substantial increase of 2,486,211, or 12.42 per cent., compared with the total of 20,011,749 for 1937. Only in two previous years has this total been exceeded—in 1915 and 1931, when the totals were 23,129,919 and 22,542,043, respectively.

The Central Western Division of the State showed an increase of 629,848, or 11 per cent.; Maranoa 606,969, or 19 per cent; North-Western 569,746, or 21 per cent.; Downs 535,579, or 21 per cent.; and Far Western 316,811, or 17 per cent. The other sheep-raising division, South-Western, showed a decrease of 188,905, or 5 per cent. Increases ranging from 22 to 34 per cent. were recorded in the adjoining Petty Sessions Districts of Cloncurry, Julia Creek, Richmond, and Winton. Substantial increases were also registered in the Blackall, Longreach, and Muttaburra districts, in the Central Western area and the Dirranbandi, St. George, Surat, and Mitchell districts in the Maranoa Division. The totals for the Petty Sessions Districts of Eulo and Quilpie, in the South-Western area declined by 16 and 28 per cent., respectively.

PIGS.

The 1938 total was 282,941, compared with 290,855 the previous year—a decrease of 2.72 per cent. Most of the pig-raising is done in the adjoining divisions of Moreton, Downs, and Wide Bay, and these three together account for 243,476, or 86 per cent. of the total pigs. As of dairy cattle, slight decreases of pigs were recorded in these divisions, but most of the other divisions registered increases.

Registered Stallions.

Subjoined is a list of stallions in respect of which Certificates of Registration were issued under "*The Stallions Registration Acts,* 1923 *to* 1934," during the year 1938-39:—

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1938-39.

Name.	No.	Age.	Colour.	Owner.
Archer	2099	5	Black	L. Gossow, Maidenwell
Backare	2195	5	Bay	E. L. Ramsay, Umbiram
Beebo Shell	2135	5	Chestnut	D. W. Bell, Beebo
Ben Braggie	2136	6	Bay	A. G. F. Munro Estate, Goodar, Goondiwindi
Bernor	2259	6	Bay	C. Meehan, Toonpan
Blandon	2196	5	Bay	P. P. Venaglia, Rous Street, Hendra
Bon Aero	2180	5	Bay	P. Brennan, Jimboomba
Brownfelt	2197	5	Bay	L. Dixon, Freestone Crescent, Hendra
Brown Laddie	2181	Aged	Brown	D. Beattie, Kenilworth
Bustle On	2198	6	Bay	J. Y. Shannon, Rodney Downs, Ilfracombe
Buzwind	2199	5	Bay	W. Rankin, Queen Street, Brisbane
Buzzard King	2200	6	Chestnut	P. J. O'Shea, River Road, Toowong
Chinga	2182	5	Chestnut	D. Jackson, Dulacca West
Chrysobus	2137	5	Bay	C. Zacka and E. Leslie, Goondiwindi
Contadino	2201	6	Brown	W. Hennessey, Hardy Street, Hendra
Craftmaster	2100	Aged	Chestnut	L. E. J. Dingle, Abercorn
Crydown	2219	Aged	Bay	J. J. O'Sullivan, Many Peaks
Dan Scorn	2101	6	Brown	W. P. Linnane, Berajondo
Darby II.	2138	5	Grey	M. G. Yorston, Gladfield
Deer Gun	2202	5	Brown	P. P. Venaglia, Rous Street, Hendra
Deer Pride	2170	5	Chestnut	W. Manz, Lowood
De-Wedge-Man	2139	5	Bay	R. A. Newman, Goondiwindi
Diamond Heather	2220	Aged	Black	W. Besch, Bajool
Diomedes	2260	Aged	Bay	L. D. Lucey, Strathvale, Mt. Garnet
Dundas	2171	Aged	Bay	M. M. Bowman, Mt. Byron, Esk
Emborough	2075	6	Chestnut	A. H. Maguire, Kialla, Greenmount
Feather Dust	2218	5	Brown	J. C. Stockden, Cinnabar
Flash Boy	2237	6	Bay	W. J. Wright, Glen Isla, Proserpine
Foundation	2172	5	Bay	L. Shine, Fernvale
Gallant Blanck	2140	Aged	Bay	J. S. Canavan, Warwick
Glyfield	2221	5	Brown	C. F. G. Collins, Strathmuir
Golden Valley	2183	5	Brown	L. K. Jeffery, Pomona
Grand Sequel	2222	6	Chestnut	W. Beak, Denham Street, Rockhampton
Head Count	2203	5	Black	H. P. Bailey, Ulmarra, N.S.W.
Jacko	2261	Aged	Brown	F. Carrington, Liontown, Charters Towers
Jovial Monk	2204	5	Black or Brown	E. L. Ramsay, Umbiram
King's Colours	2238	5	Bay	G. M. Myers, Poitrel, Nebo
K. V.	2262	6	Chestnut	Mrs. Jane Black, Pajingo, Charters Towers
Lord Bine	2206	5	Brown	W. C. Krimmer, Willowburn
Lord Bradford	2102	6	Bay	J. Collins, Nanango
Magnifier	2263	Aged	Bay	Kilpatrick Pty., Southedge, Mareeba
Malt Pie	2207	Aged	Black	V. Rowe, Bowraville, N.S.W.
Marilla Lad	2076	6	Chestnut	F. Turner, Chinchilla
Monarch	2223	Aged	Brown	H. C. Cox, Ambrose
Mondacre	2208	6	Brown	O. G. Ridge, Argyle, Toowoomba
Music	2264	Aged	Chestnut	Natal Downs Pty. Ltd., Charters Towers
My Crusader	2224	5	Chestnut	C. Hotz, Wumalgi
No name	2241	6	Chestnut	E. Y. Shannon, Tierawoomba, Nebo
Nut Shah	2077	5	Chestnut	J. W. H. Blackley, Wandoan
One More	2209	6	Bay	J. Gahan, Lilley Street, Hendra
Palfresco	2173	5	Brown	A. Wienholt, Kalbar
Peterborough	2078	5	Chestnut	J. Scotney, Greenmount
Pilgrim	2174	5	Grey	D. D. Logan, Pineview, Kilcoy
Ramillies	2079	Aged	Bay	J. Stuart, Glen Alvon, Meandarra
Realhead	2210	5	Brown	P. P. Venaglia, Rous Street, Hendra
Redcoat	2225	6	Chestnut	J. Y. Shannon, Rodney Downs, Ilfracombe
Reklaw	2103	5	Bay	L. C. Walker, Bingera
Ribbleson	2211	5	Brown	H. N. Ballantyne, Gladstone
Royal Address	2226	6	Chestnut	J. Hanrahan, Rundle Street, Wandal
Royal Rivoli	2212	5	Bay	Carr and Postle, care of L. Dixon, Hendra
Royal Scot	2104	5	Bay	A. Guiney, Tingoora
Sarnix	2227	5	Iron Grey	Camboon Pastoral Co., Camboon
Sarwell	2239	5	Iron Grey	W. H. Gillham, Suttor Creek, Nebo
Scappolo	2265	5	Chestnut	Natal Downs Pty. Ltd., Charters Towers
Scholar Chief	2228	Aged	Brown	W. J. Kelly, Banksia, Kunwarara
Sir Edmund	2266	6	Chestnut	J. Bell, Cardigan, Charters Towers
Sir Norwich	2229	Aged	Brown	W. H. Coe, Norwich Park, Clermont
Speed On (Imp.)	2080	Aged	Chestnut	A. Langmore, Prospect, Jondaryan
Starlight	2105	5	Black	L. J. Mackaway, Goomeri
Sunnie	2106	5	Chestnut	E. N. Sawtell, Coolabunia
Tantitha	2107	5	Bay	F. R. Briggs, Mount Perry
Undiger	2108	Aged	Chestnut	F. R. Briggs, Mount Perry
Vain Star	2081	Aged	Brown	V. P. Shannon, Wongongera
Verberry	2240	Aged	Brown	F. G. Schilling, Bowen
War Path	2213	6	Bay	O. G. Ridge, Argyle, Toowoomba
White Flag	2175	5	Chestnut	R. Jackson, Munbilla
Wonderland	2214	5	Bay	E. S. Cox, No. 10 Macartney Street, Paddington

PONY STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1938-39.

Name.	No.	Age.	Colour.	Owner.
Bonnie Boy	2090	5	Brown ..	H. Taylor, Gayndah
Brigalow Bill	2082	6	Black ..	H. Willacy, Brigalow
Cabulcha Stibnite ..	2179	5	Iron Grey ..	J. M. Newman, Caboolture
Chips	2083	Aged	Bay	Jas. McLellan, Goranba
Danny Boy	2091	Aged	Brown ..	L. G. Bishap, Maidenwell
Gloaming	2084	6	Bay or Brown	T. Bishop, Rocky Glen, Cooyar
Lieutenant Jim ..	2235	5	Bay ..	W. G. Blomfield, Miriam Vale
Mac's Choice	2085	5	Chestnut ..	S. H. Reynolds, 3 Glasgow Street, Toowoomba
Master Hero	2092	Aged	Brown ..	J. H. Bucholz, Gayndah
Playmate	2093	5	Piebald ..	J. J. Bauer, Watalgan
Pride of Allamby ..	2086	5	Bay	H. C. Sperling, Mountain Camp, Crow's Nest
School Boy	2236	5	Blue Grey ..	W. T. Brown, Meadbrook, Calliope
Silver	2176	Aged	Taffy.. ..	B. Hogan, 20 Moffatt Street, Ipswich
Silver King II. ..	2094	6	Dappled Taffy	E. Grace, Emu Creek, Degilbo
Silver Laddie	2087	5	Grey ..	H. F. Dornbusch, Yargullen, *via* Oakey
Springmeade Black Fox	2088	5	Black ..	E. F. Tuckey, Middle View, Square Top
Timothy	2089	5	Brown ..	Sarah Elizabeth Kineavy, Rocky Creek
TROTTER STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1938-39.				
Broad Don	2095	5	Chestnut ..	F. Otto, Inverlaw, Kingaroy
Broad Findon.. ..	2096	5	Brown ..	E. J. Campbell, Kingaroy
Derby Cole	2142	5	Bay	F. K. Weidman, Logan Road, Clifton
Joker's Echo	2097	5	Bay	T. Renfrey, Degilbo
King Wilkes	2177	Aged	Bay	A. V. Baker, Grandchester
Raven Lad	2098	Aged	Brown ..	J. Warnick, Gayndah
Yankee Sparks ..	2178	6	Bay	W. Smith, care of A. Yarrow, Mount Walker West
DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1938-39.				
Abbotsford Reformer	2143	Aged	Bay	B. O. Elsley, Belmore, Yelarbon
Airedale	2109	5	Bay	R. S. McKenzie, Maroondan, Gin Gin
Aldoman's Hope ..	2242	5	Bay	A. A. Brooks, Coningsby, Mackay
Bally	2053	5	Brown ..	Patch and McCrae, Emu Creek, Crows' Nest
Bally	2267	Aged	Bay	A. E. Carter, Box 143, Home Hill
Barney	2110	5	Brown ..	T. Embrey, Kingaroy
Baron Dale	2287	Aged	Bay	Kilpatrick Pty. Ltd., Mareeba
Barron Pear	2054	6	Bay	V. P. Shannon, Wongongera
Ben Bold	2144	5	Bay	E. Austin, Flemingdale
Benefactor	2145	5	Bay	G. McArthur, Maryvale, Warwick
Bennie Boy	2111	5	Bay	Jackson Bros., Durong
Bob	2184	5	Bay	G. Singh, Canungra
Bold Favour	2268	6	Brown ..	Pioneer Sugar Mills Pty, Ltd., Brandon
Boxvale Barron Bank	2112	5	Bay	F. Burton, Durong
British King	2146	5	Bay	T. J. Ryan, Clintonvale
Briton	2243	6	Bay	D. Hadlow, Kelsey Creek, Proserpine
Canberra Duke ..	2055	5	Bay	H. A. Koelher, Yamsion
Captain	2147	5	Bay	B. G. Erhart, Goomburra
Captain	2269	6	Bay	A. H. MacDonald, Barringha
Carlisle Boy	2148	5	Bay	J. H. McIvor, Emu Vale
Carrington Flash Cavalier	2113	Aged	Chestnut ..	W. E. Webster, Sarum, Kingaroy
Christian	2270	5	Bay	Mrs. E. C. Clarke, Maryvale, Charters Towers
Cloverdale Stamp ..	2215	Aged	Bay	D. Davidson, Walcha, N.S.W.
Clyde	2056	5	Bay	C. Barber, Rywung
Coilsfield Prince ..	2150	5	Bay	Estate Scott McLeod, Terrica, Goondiwindi
Craig Hero	2057	5	Bay	Derrick Bros., Bell
Craig Son	2058	5	Bay	G. A. Lewis, Canning Creek, Milmerran
Crest Vale Nobility ..	2152	5	Roan.. ..	A. Ritson, Clifton
Crystal MacBride II...	2059	5	Bay	Amelia Kewley, Glen Mona, The Gums
Culverthorpe High Opinion	2114	5	Bay	S. B. Trigger, Lakeside
Dalkerk	2115	5	Bay	R. G. Allen, Mount Perry
Dark Chief	2060	5	Brown ..	M. Stower, Linthorpe, Pittsworth
Dobin	2244	5	Brown ..	G. M. Myers, Poitrel Nebo.
Don	2116	Aged	Bay	A Sanderson, Monto
Donald	2271	5	Light Bay ..	W. M. Jackson, Box 191, Ayr
Dooling Major Lee ..	2117	6	Bay	M, Lobwein, Kybong
Duke II.	2185	6	Bay	J. J. Kirk, Kenilworth
Earl Dale	2161	5	Black ..	E. C. A. Zillman, Hatton Vale
Eureka Walter ..	2230	5	Liver Roan ..	C.Q.M.E. Co., Fitzroy Vale, Rockhampton
Fairymead Success ..	2245	5	Bay	R. Smith, Box 87, Bowen
Farleton John ..	2272	6	Brown ..	A. P. Nelson, Box 101, Charters Towers
Farmer	2246	5	Roan.. ..	A. Welsh, Mia Mia, Mirani
Fashion's Prince ..	2153	5	Bay	T. J. Brosnan, Killarney
General Kerr	2162	5	Bay	A. F. Schimke, Summer Hill, Laidley
Glen Donald	2061	6	Bay	G. Knauth, care of J. Zella, Middle Ridge, Toowoomba
Glen Lock	2118	5	Bay	C. F. Schmid, Nikenbah
Goldmount Prince ..	2062	5	Brown ..	C. Mesken, Maclagan
Gold Nought	2154	5	Chestnut ..	D. Sullivan, Allora
Intent	2273	Aged	Black ..	Egera Pastoral Co., Charters Towers
Jackson	2063	5	Bay	D. W. Kirstenfeldt, Kulpi, Cooyar Line
Joe	2274	5	Bay	Natal Downs Pty. Ltd., Charters Towers
Kadlunga Topnote ..	2275	5	Grey ..	J. Allingham, Hillgrove, Charters Towers
Kairi Prince	2276	Aged	Chestnut ..	T. S. Heale, Fleetwood, Kureen

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING 1938-39—*continued.*

Name.	No.	Age.	Colour.	Owner.
Kerrston Carlisle ..	2163	5	Bay	J. M. Newman, Caboolture
Kerrston's Prospect ..	2247	5	Black ..	C. D. Loadsman, Orkabie
Kerrston's Viceroy ..	2120	6	Black ..	W. D. Porter, Kumbia
Kerrstop	2122	5	Brown ..	C. F. McInnes, Gooroolba
Kerwein	2164	5	Bay	H. Schultz, Morton Vale, Gattton
King	2186	Aged	Iron Grey ..	H. Bernier, Whiteside
King Hope	2123	5	Black ..	J. H. Powell, Kumbia
Lad	2231	6	Black ..	W. C. Geddes, Balmoral, Glen Geddes
Laurel Wedgewood ..	2277	6	Chestnut ..	Bluff Downs Pastoral Co., Charters Towers
Lehmanni Tenor ..	2064	5	Black ..	Mrs. R. V. Breydon, Brooklyn, Haden
Lion	2065	5	Bay	H. Simmons, Yandilla
Logan	2248	5	Black ..	Wright and Davidson, Kemmis Creek, Nebo
Logan Prince	2187	5	Bay	J. N. Bell, Rathdowney
Lomond Douglas Bold	2189	Aged	Bay	Palen Creek State Farm, Palen Creek
Lord Kerrston ..	2066	5	Black ..	J. R. Anderson, Southbrook
Macadair	2124	5	Bay	J. Bishop, Maidenwell
Major	2125	5	Bay	W. R. Gordon, Shirley, Gayndah
Major	2126	Aged	Black ..	R. J. Brown, Brooweena
Major	2127	5	Brown ..	T. Turner, Kumbia
Major	2249	5	Bay	D. J. McLean, Gumlu
Marshall Gaiety ..	2165	5	Bay	C. A. Martens, Marburg
Marshall Ney	2250	5	Roan.. ..	M. R. Shannon, Olive Downs, Nebo
Martindale	2067	5	Bay	W. D. Specht, Avonmore, Milmerran
Maydale Knight ..	2128	Aged	Bay	L. C. Walker, Bingera
Meriwood's Desire ..	2129	5	Bay	H. H. Hayden, Bancroft
Negro	2278	5	Black ..	M. Lyons, Wambiana, Charters Towers
Nelson	2251	5	Chestnut ..	D. Hadlow, Kelsey Creek, Proserpine
Noble	2068	5	Bay	R. Mitchell, Pinewood, Millmerran
Noble	2252	6	Brown ..	G. Shinn, North Side, Mackay
Noble	2279	Aged	Bay	C. Brownson, Slogan Downs, Charters Towers
Noble Intent	2253	5	Brown ..	A. F. Clausen, Homebush Road, Mackay
Peri Paddy	2254	5	Brown ..	G. J. Roger, Peri, Mackay
Poplar	2255	5	Blue Grey ..	E. Collins, Gumlu
Premier Pride.. ..	2130	5	Bay	A. Tanner, Bundaberg
Prince	2069	5	Bay	N. Thornton, Rocky Creek
Prince	2070	5	Black ..	E. H. Budden, Pelican
Prince	2155	5	Bay	J. O. Coleman, Cobba-da-mana
Prince Charlie ..	2156	5	Bay	Gross Bros., Campbell's Plains
Prince Dudley ..	2280	Aged	Bay	R. J. Atkinson, Cashmere, Mount Garnet
Prince George.. ..	2131	5	Bay	W. H. White, Prawle, Maryborough
Prince Rocket ..	2132	5	Bay	McCauley and Stewart, Mundubbera
Robin Dale	2190	5	Bay	J. L. Everdell, Woodhill
Rob Roy	2071	5	Black ..	A. H. Gierke, Chinchilla
Rocket..	2157	5	Bay	A. W. Naumann, Mount Kent, Nobby
Ron	2133	5	Bay	D. C. Myles, Mungungo
RoseFarmBold Kerrston	2166	5	Bay	J. W. Evans, Boonah.
Royal Dale	2072	5	Black ..	I. N. Kahler, Geham
Royal Dale	2281	Aged	Bay	R. J. Atkinson, Cashmere, Mount Garnet
Royal Dan	2158	6	Bay	W. J. Agnew, Talgai Farm, Allora
Royal Intent	2159	5	Bay	H. J. Pacholke, Five Ways, Clifton
Royal Kerr	2232	5	Bay Roan ..	F. R. Lehmann, Biloela
Royal Richard ..	2160	5	Bay	H. Butler, Pozieres
Royal Scott	2167	5	Bay	J. L. Strack, Mount Whitestone, Grantham
Sailor	2233	5	Brown ..	R. J. Collins, Yeppoon
Shepherd Hill Sandy Kerlin	2256	5	Brown ..	C. Johnson, Gargett
Shepherd's Pride ..	2073	5	Brown ..	H. A. Nauschutz, Canaga, *via* Jandowae
Sirdar	2286	6	Bay	Mavis Cassady, Mungalla, Ingham
Sirvale	2257	Aged	Brown ..	F. McNeil, Bowen Road, Proserpine
State Insignia.. ..	2191	Aged	Bay	L. K. Jeffery, Pomona
Sydler	2258	5	Brown ..	J. Dalton, Pleystowe
Talgai Hero	2074	5	Black ..	W. Freyling, Hodgsonvale
Tarzan	2168	5	Bay	Roderick Estates, Wilson's Plains
Thunder	2282	Aged	Brown ..	J. Coleman, Glen Haughton, N.Q.
Toby	2192	5	Bay	J. Herron, Closeburn
Tom	2193	5	Bay	S. Lahrs, Norwell
True Blue	2194	5	Grey ..	B. T. Smiles, Palen Creek
Ulupna Glade ..	2283	5	Bay	W. C. Storer, Upper Barron, Atherton
Victoria Flash Game..	2284	6	Bay	R. J. Atkinson, Cashmere, Mount Garnet
Wickside Brilliant Son	2134	Aged	Bay	S. E. Strong, Proston
Wolsingham Gold Miner	2285	5	Bay	M. Marnane, Atherton
Young Kerrston ..	2169	5	Bay	R. Mahaffey, Grantham
Young Times	2234	5	Brown ..	J. Carmody, Theodore

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1938-39.

Bright	1762	3	Bay	J. A. Collett, Pomona
Brownlot	1800	4	Brown ..	Langan Bros., Alice River, Townsville
Cannon Fly	1661	3	Chestnut ..	S. Otto, Bum Bum Creek, Crow's Nest
Capple Bar	1678	3	Brown ..	H. G. Stockill, Proston
Coonan Valley ..	1679	4	Bay	C. E. K. McCord and Co., Eidsvold
Fern Coolin	1700	4	Black ..	P. A. Wright and Sons Ltd., Kindon, Goondiwindi
Gold Dust	1749	3	Bay	A. H. Kunde, Hazeldene, Kilcoy (Provisional)
Goldhunter	1662	3	Brown ..	B. H. Brown, Wandoan

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1938-39—*continued.*

Name.	No.	Age.	Colour.	Owner.
Goodlad	1801	4	Brown	F. R. Wieland, Herberton
Great Scott	1793	4	Chestnut	F. A Ross, Waitara, Nebo
King's Command	1811	4	Bay	B. Wagner, Brighton, Sandgate
Knightguard	1750	3	Bay	F. P. Buhle, Boonah
Mannar	1681	3	Chestnut	W. Titmarsh, Yerra
Natural Silver	1751	4	Chestnut	P. M. Ryan, Viewland, Gatton
Pavonian Prince	1782	4	Chestnut	E. T. Kelly, Glen Isla, Kunwarara
Peter Pan	1682	4	Bay	T. J. Scott, Ivanhoe, Proston
Picamar	1781	4	Bay or Brown	Ramsay Bros., Oondooroo, Winton
Saracen	1703	3	Grey	J. T. Scrymgeour, Warwick
Some Day	1683	4	Brown	R. Pickels, Coolabunia
Somerset	1752	4	Grey	W. Armstrong, Glencoe, Esk
Tony	1684	4	Chestnut	W. H. Sawtell, Wondai

PONY STALLIONS CERTIFICATED FOR THE YEAR 1938-39.

Name.	No.	Age.	Colour.	Owner.
Bernie Star	1670	3	Brown	N. H. L. Robson, Crawford
Black Jewel	1753	4	Black	A. J. Anderson, Teape Street, Silkstone
Black Prince	1671	4	Black	A. J. Manning, Mondure
Beau-Saada	1663	3	Creamy	G. McCorry, Bringalily, Milmerran
Cabulcha Cinnabar	1759	3	Chestnut	J. M. Newman, Caboolture
Comet	1672	3	Black	A. F. W. Pool, Wondai
Dynamite	1754	4	Bay	J. H. Parfitt, Murrumba, Esk
Gold Cuffs	1701	3	Taffy	E. E. Belford, Wilga Park, Texas
Jubilee	1755	3	Black or Brown	E. Clarke, Thornton, Laidley
Khedive	1673	3	Grey	R. B. Jefferies, Nanango
Little Jim	1756	4	Bay	J. C. Logan, Rosefarm, Gatton
Master Don	1665	3	Brown	W. J. Smith, Pittsworth
Master Signet	1702	4	Bay	F. Burns, College Road, Stanthorpe
Model	1757	3	Bay	E. Hansen, Old Township, Laidley
Playmate	1780	3	Black	R. W. Pitman, Mulgowie
Prince Carda	1791	4	Brown	C. H. Hammond, Ubobo
Shaza	1664	4	Iron Grey	Jean Thomas, Toowoomba
Sheik	1674	3	Grey	R. B. Jefferies, Nanango
Silver King	1675	4	Chestnut	E. Litfin, Mondure
Silver Thread	1792	4	Taffy	F. W. Tully, East End, Mount Larcom
Sparkler	1676	4	Chestnut	S. B. Trigger, Lakeside
The Imp	1704	3	Dapple Grey	A. J. Savage, Cooinoo, Gore
Theo	1666	4	Creamy	E. G. Lister, Shenstone, Warra
Tommy	1701	4	Iron Grey	E. V. Dwyer, Tuchekoi, Pomona
Wee Jim	1705	4	Chestnut	R. A. Newman, Goondiwindi

TROTTER STALLION CERTIFICATED FOR THE YEAR 1938-39.

Name.	No.	Age.	Colour.	Owner.
Arrow Lad	1667	3	Black	H. C. Hope, Irvingdale, Bowenville
Broadwood	1677	4	Bay	A. C. Underwood, Tingoora
King David	1758	4	Black	P. Staines, Templin, Boonah
Sparkling Arrow	1668	3	Black	T. Walker, Maclagan
Sparkling Wilkes	1669	4	Brown	E. Darr, Mount Irving

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1938-39.

Name.	No.	Age.	Colour.	Owner.
Abbey Gift	1646	3	Bay	J. V. Willis, Meringandan
Admiral Gaiety	1723	3	Bay	G. Winks and C. Boyle, Harrisville
Ajax	1645	3	Bay	F. Cuskelly, Box 16, Cooyar
Alan	1794	4	Brown	E. G. Lascelles, Goorganga, Proserpine
Alta Craig Lustre Dignity	1774	3	Brown	J. Hunter, Mulgowie
Ardlaw's Son	1706	3	Bay	B. Hegarty, Back Plains, Clifton
Arolla's Heir	1707	4	Bay	D. Ryan, Allora
Back Plains Banker	1708	3	Bay	C. Lack, Back Plains, Clifton
Balmedie Superb	1647	3	Brown, grey hairs	Mrs. R. V. Breydon, Haden
Balwherrie Intent	1685	4	Bay or Brown	F. Tucker, Ellesmere
Baron Favourite	1710	4	Bay	P. Fogarty, Headington Hill, Clifton
Barron Chief	1724	4	Bay	T. M. McGrath, Kalbar
Berriew Premier	1725	4	Bay	F. D. Arthur, Stockyard Creek, Helidon
Black Boy	1795	4	Black	E. G. Lascelles, Goorganga, Proserpine
Bold Dignity	1648	3	Bay	G. and H. Tews, Springside, Pittsworth
Bold Exchange	1686	4	Bay	H. V. Petersen, Kolan River South
Bonnie Charlie	1649	4	Bay or Brown	C. H. Barrett, Bruan Park, Tara
British Prince	1687	3	Bay	W. J. Brims, Blackmount, N.C.L.
Brookville Gaiety	1763	3	Brown	Walsh Bros., Laravale
Bully Bar	1783	4	Bay	V. R. Katte, Kola Bar, Dingo
Captain	1784	4	Bay	W. J. White, Ivanhoe, Milman
Captain	1785	4	Bay	C. T. Johnson, Gracemere
Captain Lustre	1764	3	Bay	J. T. Collett, Pomona
Castlemaine	1660	4	Bay	E W. Watson and Son, Welford, Nangwee
Clinker	1786	4	Bay	J. Moran, Taragoola
Cornish Laddie	1726	5	Bay	H. O. Mischke, Veradilla (Provisional)
Croydon Gaiety de Luxe	1727	3	Bay	A. I. Titmarsh, Roadvale
Dale Pride	1728	4	Bay	A. R. Zischke, Hatton Vale
Darcy	1688	3	Bay	M. F. Tobin, Wallaville
Dark Chief	1802	4	Black	H. Webb, Reid River, G.N.R.
Don	1711	4	Bay	W. A. Lyell, Boney Mountain, Cunningham
Donald Intent	1729	3	Bay	J. Coyne, Grandchester

DRAFT STALLIONS CERTIFICATED FOR THE YEAR 1938-39—*continued.*

Name.	No.	Age.	Colour.	Owner.
Duke	1730	4	Bay	H. Bullock, Murrumba Road, Esk
Duke of Suffolk ..	1731	4	Chestnut ..	Ivy May Arndt, Rosewood
Duke of Windsor ..	1765	4	Bay or Brown	C. Maas, Waterford
Dunure's Delight ..	1803	3	Brown, grey hairs	B. A. Lynn, Box 163, Ingham
Extent	1766	4	Black ..	B. T. Smiles, Palen Creek
Fabric's Gaiety ..	1732	3	Bay or Brown	H. Fritz, Teviotville
Fairholme Eclipse ..	1689	3	Bay	A. and J. Sippel, Redgate, Murgon
Fairval Noble ..	1733	3	Bay	H. Warnemünde, Toogoolawah
Fairymeade Bold Lorraine	1787	4	Bay	H. C. Dougal, Littlemore
Gaiety's Favour ..	1734	3	Bay	W. F. Ehrich, Kulgun
Glenbar Baron Kerr ..	1712	3	Bay	A. Jensen, Swanfels
Glen Kerr	1735	4	Black ..	P. Ryan, Viewlands, Gatton
Glenmore II.	1788	4	Black ..	A. Ziebarth, Biloela
Hiawatha	1690	3	Brown ..	F. E. Mitchell, Byee
Homedale Honour ..	1796	4	Bay	S. McLennan, Red Hill, Nebo
Irton Choice	1736	3	Bay	A. Joseph, Lockrose, Forest Hill
Johnnie Walker ..	1659	4	Brown ..	E. W. Watson and Sons, Welford, Nangwee
Jolly Gloucester ..	1767	4	Bay	S. O. Mear, Maleny
Jondaryan Cheers ..	1651	3	Brown ..	Jondaryan Estates, Jondaryan
Jondaryan ?	1656	3	Brown ..	Jondaryan Estates, Jondaryan
Kadalunga Son ..	1804	3	Grey ..	Ryan Grazing Co., Manton, G.N.R.
Kerrston's Joker ..	1737	3	Bay	P. W. Krause, Marburg
King Billy	1768	4	Bay	A. O. Bishop, Caboolture
Knight Superb ..	1691	4	Bay	A. Tanner, Bundaberg
Leeds Grove Slade Alba	1692	4	Bay	Fairymead Sugar Co. Ltd., Bundaberg
Lochiele	1805	3	Bay	S. W. Smith, The Wattles, Ravenshoe
Lord Nelson	1652	3	Brown ..	E. M. Schefe, Coalbank, *via* Wutul
Loyal Carlisle ..	1713	4	Black ..	W. Doro, Glassy Mountain, Pozieres
Major	1693	4	Bay	C. A. Taylor, Brooloo
Major	1806	3	Bay	Spotswood Bros., Home Hill
Major Wallace ..	1738	4	Bay	B. C. Zislowski, Lilyvale, Helidon
Maxwell	1739	4	Bay	M. W. Kruger, Coleville, Harrisville
Napuna Lad	1714	4	Brown ..	P. Fogarty, Headington Hill, Clifton
Noble	1715	4	Bay	M. McMahon, Sladevale
Noble King	1716	3	Bay	D. C. O'Leary, King's Creek
Oxford Don	1694	4	Bay or Brown	S. J. and C. Jenkins, Theebine
Pigeon's Pride ..	1789	3	Bay	W. T. Brown, Meadowbrook, Calliope
Pride of Marcellus ..	1769	3	Black ..	W. and J. Welk, Nambour
Prince	1740	4	Bay	D. B. O'Day, Linville
Prince	1770	3	Bay	N. V. Burnett, Rathdowney
Prince	1807	4	Blue Grey ..	A. J. Buck, Barringha, G.N.R.
Prince Wallace ..	1797	4	Bay	A. Carena, Inneston, N.C.L.
Prospect	1717	3	Bay	R. E. Gillespie, Junabee, Warwick
Punch	1653	3	Bay	J. Wharram, Wellburn, Jandowae
Rana	1808	4	Grey ..	Mrs. E. C. Clarke, Maryvale, Charters Towers
Ranger	1695	3	Bay	H. C. Taske, Bundaberg
Rare Gaiety	1741	3	Black ..	R. Harsant, Warril View, Harrisville
Red Robin	1718	4	Bay	W. A. Deacon, Allora
Rex	1742	3	Bay	S. Walker, Woodford
Rich Lad	1696	4	Bay	H. Welsh, Proston
Rosefarm Regal Lustre	1743	3	Bay	R. Drew, Forest Hill
Royal Chief	1699	5	Chestnut ..	W. R. Lester, Monduran (Provisional)
Royal Duke	1771	3	Bay	F. Paulger, Kidman Creek, Obi Obi
Royal Kerrston ..	1772	4	Brown ..	W. and S. Welk, Nambour
Royal Reserve ..	1744	3	Bay	J. Morrow, Peak Crossing, Ipswich
Royal Scotch	1809	3	Grey ..	P. Kidd, Malanda
Royal Stephan ..	1654	4	Bay	S. T. Evans, Seven Oaks, Chinchilla
Scottish Farmer ..	1745	4	Bay	Mrs. G. Montgomery, Laidley
Sergeant Bruce ..	1655	4	Bay	A. J. P. Kruger, Greyhurst, Goombungee
Squaredale Pride ..	1719	4	Bay	B. A. Hoffman, Emu Vale
Square William ..	1720	4	Bay	G. H. Battke, Emu Vale
St. Helen's Cavalier ..	1775	4	Bay	Baumgarten Bros., Meandarra
St. Hilda's Nugget ..	1746	3	Bay	W. Profke, Glamorgan Vale
Talgai Duke	1657	4	Bay	J. D. Learmonth, Springside, Pittsworth
Tent Hill Victory ..	1747	4	Bay	W. H. Grams, Upper Tent Hill
Top Boundary ..	1748	3	Bay	A. Wienholt, Kalbar
Trementheere Royal	1697	3	Light Bay or Roan	A. H. Tanzer, Abercorn
Westphalia Laddie ..	1776	4	Bay, grey hairs	F. A. Lehmann, Lismore, Victoria
Wheatley Lustre's Pride	1810	3	Brown ..	L. Favier and Sons, Kairi
Wigton's Pride ..	1721	3	Bay	W. V. Noble, Freestone
Willowbank Footprint	1798	4	Brown ..	N. F. McLennan, Gargett
Wolsingham Imperialist	1790	3	Bay	T. Clark, Wietalaba
Wolsingham Links Maker	1777	3	Bay	T. Robson, Crow's Nest, N.S.W.
Wolsingham Money Boy	1778	3	Brown ..	T. Robson, Crow's Nest, N.S.W.
Wolsingham Superb ..	1779	4	Black ..	T. Robson, Crow's Nest, N.S.W.
Woolamia Lionel ..	1722	4	Bay	W. Gunn, Kildonan, Goondiwindi
Woolamia Peter ..	1799	4	Bay	D. A. Roberts, Bundara, Nebo
Young Douglas ..	1773	3	Bay	J. Martin, Tamborine

REJECTED STALLIONS.

List of Stallions in respect of which Certificates of Registration were refused on account of either lack of type and/or conformation, lack of size or unsoundness, during the year 1938-39. These horses are prohibited from service, either public or private:—

BLOOD STALLIONS REJECTED DURING THE YEAR 1938-39.

Name.	Age.	Colour.	Reason for Rejection.	Owner.
Cruger	4	Black	L. T. and C.	R. O. Bayntun, Didcot
Cryptic	Aged	Iron Grey	L.C.	A. Ferman, care of J. H. Louis, Glen Ray, Mundubbera
Flying Scotchman	3	Chestnut	L.S.T. and C.	W. J. Stephen, Yarraman
My Gun	Aged	Brown or Black	L.C.	L. W. Taylor, Dulbolla
The Sheik	3	Bay	L.S.T. and C.	W. Boles, Emu Vale
Vivian's Choice	5	Chestnut	L.T.	V. C. Fogg, Samsonvale

PONY STALLIONS REJECTED DURING THE YEAR 1938-39.

Name.	Age.	Colour.	Reason for Rejection.	Owner.
Mickey the Mouse	3	Skewbald	L.T.	H. Simmons, Yandilla
Pepper	4	Black	Unicrypt.	C. E. Wein, Derra, Mundubbera
Sentinel II.	4	Bay	L.T. and C.	G. A. F. Bourne, Biggenden
Zulu	5	Brown	L. T. and C.	F. A. Chardon, Mount Morgan

TROTTER STALLION REJECTED DURING THE YEAR 1938-39.

Name.	Age.	Colour.	Reason for Rejection.	Owner.
Spot	Aged	Skewbald	L.T. and C.	S. Russell, Chinchilla

DRAUGHT STALLIONS REJECTED DURING THE YEAR 1938-39.

Name.	Age.	Colour.	Reason for Rejection.	Owner.
Baron Bruce	Aged	Dark Chestnut	L.T. and C.	S. F. Booth, Gin Gin
Baron Model	4	Bay	L.T. and C.	T. H. Oberhardt, Pittsworth
Baron Trump	Aged	Bay	S.B.	W. C. Walz, Marian, Mackay
Billy	3	Brown	L.T. and C.	T. C. Hughes, Upper Barron, Atherton
Birm II.	4	Bay	L.T. and C.	G. Wilson, Degilbo
Black Kerr	5	Brown	L.T. and C.	J. C. Webster, Gargett
British Lad	4	Bay	L.T. and C.	F. E. Turner, Chinchilla
Bully	Aged	Brown	L.T. and C.	S. Searle, Home Hill
Captain	5	Bay	L.T. and C.	D. Stone, Killawarra, Miles
Captain	4	Brown	L.C.	D. Miles, Pimpama
Crystal Blaze	5	Bay	S.B.	E. Cooper, Senr., Pratten
Daniel Dale	4	Bay	S.B.	J. Campbell, Djuan, Haden
Don	3	Dark Bay	L.T. and C.	W. J. McLelland, Box 192, Ayr
Don	Aged	Bay	L.T. and C.	F. Wieland, Herberton
Duke	Aged	Bay	L.T. and C.	E. L. Risdale, Balfe's Creek
Duke	5	Roan	L.T. and C.	H. J. Read, Gregory River, Strathaka
Duke	6	Bay or Brown	L.T. and C.	J. E. Eite, Maleny
Duke	5	Bay	L.T. and C.	G. Low, Pomona
Glen Dale	5	Bay	S.B.	P. W. Bermingham, Ivy Bank, Greenmount
Gowrie of St. Helens	3	Bay	Unicrypt. and L.C.	O. A. G. Free, The Hermitage, Warwick
Havelock	4	Bay	L.C.	D. H. Butler, Yellowstone, Miles
Irton Glen	3	Bay	Unicrypt.	A. Joseph, Prenzlau, Lowood
Jungle's Pride	Aged	Black	S.B. and R.B.	E. L. Risdale, Balfe's Creek
Lustre's Choice	3	Bay	L.C.	E. Ford, Pomona
Macsturgeon	5	Bay	L.T. and C.	M. Marnane, Atherton
Major	3	Brown	L.T. and C.	E. J. Fry, Peeramon
Marble Intent	4	Blue Grey	S.B. and Thoro	T. Comerford, Finch-Hatton
Maxie	4	Roan	L.T. and C.	C. Brownson, Slogan Downs, Charters Towers
Noble Kerr	3	Black	L.T. and C.	J. S. Schmidt, Mount Sylvia, Gatton
Nugget	5	Bay	L.T. and C.	Berryman Bros., Home Hill
Piper II.	5	Chestnut	Unicrypt. and L.T. and C.	E. H. McGregor, Waroolaba, Radford
Pride of Springsure	4	Bay	S. B.	H. E. Carey, Yangan
Prince	3	Bay	L.T. and C.	J. K. Nielson, Upper Clifton
Prince	Aged	Bay	S.B.	J. R. Colvin, Keepit, Manilla, N.S.W.
Prince	Aged	Brown	L.T. and C.	G. E. Bishop, Toorbul
Punch	5	Bay	L.T. and C.	R. Norris, Airedale, Ayr
Punch	4	Brown	L.T. and C.	Lyons and Son, Box 118, Giru
Punch	6	Bay	L.T. and C.	J. C. Randell, Carmila
Royal Pride	3	Bay	L.T. and C.	J. B. Pennell, Kalbar
Royal Reserve	Aged	Bay	L.T. and C.	B. D. J. Clark, Yarra Farm, Sarina
Shady Glen	Aged	Grey	L.T. and C.	T. P. Smith, Post Office, Mareeba
Unnamed	3	Bay	L.T. and C.	F. Lee Hong, Yungaburra
Unnamed	3	Light Bay	L.T. and C.	A. Marks, Atherton
Unnamed	6	Bay	L.T. and C.	Estate J. S. Love, Valley of Lagoons, Ingham
Unnamed	Aged	Bay	S.B.	S. E. Hobbs, Victoria Estate, Ingham
Unnamed	Aged	Bay	L.T. and C.	Hally Bros., Pittsworth

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of October, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD 350 LB.)			
Folkestone Myrtle	N. Bidstrup, Ehlma, Warra	12,908·78	474·734	Dinkum of Thorndale
Sunnyside Mabel 10th	P. Moore, Wooroolin	9,417·4	380·095	Countess Lord of Cosey Camp
	JUNIOR, 3 YEARS (STANDARD 270 LB.)			
Rhodesview Strawberry 4th	W. Gierke and Sons, Helidon	9,117·39	303·3	Blacklands Prospector
	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Sunnyview Rosette 2nd	N. L. Siemon, Beaudesert	10,097·54	390·859	Burradale Byron
	JERSEY.			
	MATURE COW, (STANDARD 350 LB.)			
Glenview Successor	F. P. Fowler and Son, Glenview, Coalstoun Lakes	7,495·8	378·172	Trinity Officer
	SENIOR, 4 YEARS (STANDARD 330 LB.)			
Pineview Brighteyes	J. Hunter and Sons, Borallon	6,510·99	361·583	Oxford Jeweller
	JUNIOR, 4 YEARS (STANDARD 310 LB.)			
Strathblane Palatines Dahlia	W. and C. E. Tudor, Branch Creek, Gayndah	7,432·5	390·511	Gunawah Prometheus
	JUNIOR, 3 YEARS (STANDARD 270 LB.)			
Woodlands Fashion	D. R. Hutton, Bellgarth Cunningham	7,383·07	382·793	Kenmore Victor
Foxteth Fairy	W. C. Dunn, Wolvi, Gympie	5,015·1	310·635	Trinity Knight
Carnation Princess Victoria	D. R. Hutton, Bellgarth, Cunningham	5,177·5	298·783	Vinchelez Golden Victory
	JUNIOR, 2 YEARS (STANDARD 230 LB.)			
Glenview Flower	J. Hunter and Sons, Borallon	6,187·38	320·469	Pineview Reliance
Glenmoore Some Fern	L. J. Comisky, Warra	4,544·92	264·831	Some King of Glenmoore
Westwood Lustre	E. J. and H. G. Johnson, Beaudesert	4,640·35	261·586	Westwood Royal Hero
Carnation Bonny Etty	G. Harley, Childers	4,753·42	258·393	Carnation Golden Charmer
Glenview Sunny Girl	F. P. Fowler and Son, Glenview, Coalstoun Lakes	5,455·2	252·847	Trinity Governor's Hope
Glenmoore Noble's Hope	L. J. Comisky, Warra	4,911·92	248·431	Kelvinside Noble Golden Prince

General Notes

Staff Changes and Appointments.

Messrs. A. L. Clay and K. M. Grant, Government Veterinary Surgeons, have been transferred from Atherton to the Animal Health Station, Oonoonba, Townsville, and from the Animal Health Station, Oonoonba to Atherton, respectively.

Constable P. H. Barnett (Windorah) has been appointed also an inspector under the Slaughtering Act.

Mr. H. H. R. Walker (Camp Hill) has been appointed an inspector under the Stock, Slaughtering and Dairy Produce Acts, Department of Agriculture and Stock, and will be stationed at the Oxley Bacon Factory.

Mr. D. A. Bacon, inspector under the Dairy Produce, Stock, and Slaughtering Acts, will be transferred from Oxley to Mareeba.

Mr. R. M. K. Snell, instructor in cheese making, Toowoomba, will be transferred to Brisbane.

Mr. A. C. P. Nurcombe, cotton grader, will be transferred from the Glenmore Ginnery, Rockhampton, to Brisbane.

Mr. C. D. O'Brien, Police Magistrate, has been appointed also chairman of the Bingera, Fairymead, Gin Gin, Millaquin, and Qunaba Local Sugar Cane Prices Boards and an agent of the Central Board.

Mr. E. Raff, Amity Point, Stradbroke Island, has been appointed an honorary protector under the Fauna Protection Act.

Constable M. Flynn, Barcaldine, has been appointed also an inspector under the Slaughtering Act.

Constable J. T. Doherty, Eumundi, has been appointed also an inspector under the Slaughtering Act.

Mr. C. R. Tummon, Slaughtering, Stock, and Dairy Inspector, has been transferred from the Doboy Bacon Factory to the Oxley Factory.

Mr. P. Round, Inspector of Stock, Pittsworth, has been appointed also an inspector under the Brands Acts.

Mr. S. W. Masters, Victoria Point, has been appointed an honorary protector under the Fauna Protection Act and an honorary ranger under the Native Plants Protection Act.

Wild Life Preservation.

Appointments made under "*The Fauna Protection Act of* 1937" and "*The Native Plants Protection Act of* 1930" include those of Messrs. C. T. Campbell (Mayne Junction), G. A. Lennard (Balmoral), and O. Lacy (Amity Point), who have been appointed honorary protectors and rangers.

An Order in Council issued to-day under the Fauna Protection Act, declares an area embracing the air base and pilot station, Karumba, to be a sanctuary for the protection of fauna.

An Order in Council has been issued under the Fauna Protection Act declaring portion of the Obi Obi Creek and surrounding lands near Maleny to be a sanctuary for the protection of fauna. Messrs. W. H. R. Burnett, W. M. Dunlop, J. A. Grigor, and A. C. Dickson, of Maleny, have been appointed honorary protectors for the sanctuary.

Grade Standards for Plums.

The Regulation under the Fruit and Vegetables Acts embodying the existing grade standards for plums has been rescinded, and a new Regulation, covering new grades has been issued in lieu thereof. The plum grades at present permit the marketing of practically all sizes of plums, but the new grades prescribe a minimum, in the case of certain varieties of plums which have been set out in two tables, of one and three-eighths inches and one and a-half inches in diameter.

Stock Foods Regulations.

Amendments of the Regulations in force under the Stock Foods Acts have been approved, and these include the issue of a revised list of stock foods, the foreign ingredients contained therein, and the proportion or amount of such foreign ingredients allowed.

The preparation of certain stock foods is also described.

Mossman Mill Assessment.

An Order in Council has been issued under the Regulation of Sugar Cane Prices Acts providing that the total assessment which the Minister may make and levy on every ton of sugar-cane received at the Mossman sugar mill during the 1938-39 season shall be one penny farthing (1¼d.) per ton. Assessment at the rate of one penny per ton has already been levied on all sugar mills throughout the State. The additional amount, in the case of Mossman, is required to cover expenditure on surveys necessitated by alterations in assignments decided upon by the Central Sugar Cane Prices Board.

Plywood and Veneer Board Levy.

Regulations under the Primary Producers' Organisation and Marketing Acts empower the Plywood and Veneer Board to make a levy on suppliers of plywood and veneer at the rate of three pence per hundred feet face measurement, to be used for administrative expenses of the board. These Regulations have been amended to provide that the levy shall be at a rate not exceeding threepence per hundred feet face measurment as the board may from time to time determine.

Wheat Board.

Result of the voting in State Wheat Board Election:—

J. G. Todd, Goomburra, 1,556 votes; A. C. V. Bligh, Condamine Plains, 1,438 votes; W. J. Brimblecombe, Pirrinuan, 1,389 votes; T. W. McIntyre, Yarranlea, 1,299 votes; A. C. Kreig, Brookstead, 1,204 votes; A. J. Booth, Junabee, 1,188 votes; W. Milne, jnr., Cambooya, 1,188 votes; R. Hembrow, Wallumbilla, 909 votes; F. F. Neumann, Hodgson, 817 votes; R. Swan, Wallumbilla, 258 votes.

The new members will be appointed for a term of three years.

Egg Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts giving notice of intention to extend the operations of the Egg Board for the period from 1st January, 1939, to 31st December, 1944.

A further Order in Council has been issued amending the constitution of the Egg Board to provide that persons entitled to vote at elections or referenda in connection with the Board, in addition to having grown the commodity for the nine months preceding the date of the election or referendum, shall also have regularly supplied their produce to the Board.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts exempting certain growers of eggs from the provisions of Section 15 of such Acts.

Section 15 of the abovementioned Acts provides that all the commodity shall be delivered to a marketing board or its authorised agents for sale by the board on behalf of the growers. The commodity board may, in certain cases as may be prescribed or approved by the Minister, exempt certain growers of the commodity, or sales, from the operation of the Section.

The Regulations issued set out specifically what is required of a grower of eggs who seeks and is granted exemption from the obligations imposed by Section 15 to deliver his product to the Egg Board or its authorised agents. The Board is empowered to grant exemption, on terms and conditions prescribed, in respect of—

(1) Sales of eggs for hatching purposes;

(2) Such small growers as the Board thinks fit;

(3) Sales direct to local consumers or retail vendors;

(4) Any other transactions as may be approved by the Minister.

Such exemptions, however, may be limited to the person or persons named and to localities.

The Regulations also are designed to tighten the control of the board over the sale of eggs and to facilitate the collection of levies and equalisation deductions from growers exempted as above.

An Order in Council has been issued under "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1935," providing that growers of eggs who, during any period from the 1st January, 1934, to the 31st December, 1938, marketed eggs in accordance with the Acts, shall have recorded to their credit in the books of the Queensland Egg Board, evidence of their interest in the Egg Board's general reserve fund of £20,000.

The Board is required, as soon as convenient after the 1st January, 1939, to cause a tentative calculation to be made of the sums to be credited to growers, and immediately thereafter by a notice inserted in a newspaper published in Brisbane give notice of its intention to credit the sum of £20,000 to the growers abovementioned. The Board shall also give notice to each grower at his last known place of address of this intention. These notices will indicate a date, three months later, before which growers who wish to participate in the crediting of the reserve funds must lodge their claim with the Board.

Credit is to be made to each person concerned in the proportion which the total of the sums paid and payable to each such grower for eggs marked by him within the period 1st January, 1934, to 31st December, 1938, bears to the total sum paid and payable to all growers for eggs marketed in accordance with the Acts during that period.

After the amount has been credited amongst growers in the manner indicated, each grower concerned shall be issued with a certificate, non-negotiable and non-transferable, except in special circumstances, showing the amount standing to his name in the books of the Board.

The amount credited in the books and shown on the certificate will not constitute debt owing by the Board, nor will it be a charge over the assets of the Board. It will, however, be used as a basis for calculations in relation to the revolving building fund of the Board.

The reserve fund of £20,000 is maintained by the Board as a set-off against an overdraft with the Commonwealth Bank loaned on account of the Egg Board's building, storage plant, and machinery, &c., at Makerston street, Brisbane, for the maintenance, insurance, depreciation, &c., of which provision is to be made by the Board out of its income.

The Order in Council provides also that growers shall be credited, in future, in like manner, for their interest in the annual payment of £2,000 to the bank in reduction of the Board's building account overdraft, but so that—

(*a*) Sums provided for depreciation although paid to the Commonwealth Bank in reduction of the Board's building account overdraft shall not be reckoned as part of the said sum to be credited to growers;

(*b*) The sum to be credited to growers in any year shall not be greater than a sum which if added to all sums previously credited to growers would equal the net surplus of the assets over all the liabilities of the Board whether actual or contingent upon the thirty-first day of December preceding.

After the Board's building account overdraft with the Commonwealth Bank has been entirely repaid, the Board shall continue to set aside each year the sum of £2,000, or such other sum as may from time to time be determined by the Board with the approval of the Minister, and thereupon the fund shall commence to revolve. Such sum shall be applied in payment of the earliest amounts credited to growers in the books of the Board.

In the meantime the Board shall pay interest to growers upon the sums standing to their credit, at a rate to be fixed by the Board from time to time but not exceeding 2½ per cent. per annum.

Field Rat Destruction.

An Order in Council has been issued under "*The Sugar Experiment Stations Acts*, 1900 *to* 1938," declaring that Section 7A of such Acts shall be amended to provide for the disposal or refund of any surplus funds remaining after the proper disbursements of moneys raised by way of special assessment. The Order in Council further declares that the surplus funds representing the unexpended portion of a levy made under section 7A of the Sugar Experiment Stations Acts in respect of the Victoria and Macknade Sugar Mills for the purpose of rat destruction shall be paid to the Victoria and Macknade Cane Pests Board.

Queensland's Population.

The official estimate of Queensland's population for the 30th June, 1938, exceeded the figure of 1,000,000 for the first time. This figure, however, includes a considerable seasonal tourist population, and the figure of true resident population passed the million mark about the end of July so far as can be estimated. At 30th June, 1938, population was estimated to be 1,003,172 persons. The number of males was 525,117 and females 478,055.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Queensland Botanist, Mr. C. T. White, F.L.S.

Plants from the Bell District Named.

V.R.C. (Cooranga North, via Bell)—

1. Cape spinach or prickly jack, *Emex australias*, also called bull head burr, a name applied, however, to other burrs in Queensland. A native of South Africa, but now widely spread as a weed in different parts of Australia. It is more abundant in the southern States than in Queensland, although it is quite a bad weed here and there. The name spinach is applied to it because the leaves have sometimes been used as a substitute for ordinary spinach.
2. Crane's bill or crow foot, *Erodium cygnorum*, a wellknown fodder of the Darling Downs. It is not the best, however, of the crow foot species.
3. Hen bit or dead nettle, *Lamium amplexicaule*, a plant closely allied to the stagger weed or mint weed, and, like it, causes staggers or shivers in working or travelling stock. Ordinary paddock or resting stock, however, feed on the plant with impunity.
4. A variety of pepper cress or mustard weed, *Lepidium fasciculatum*, widely eaten by stock, but taints milk rather badly.
5. The common vervain, *Verbena officinalis*, a very common weed on the Downs.
6. Lamb's tongue or plantain, *Plantago varia*, generally regarded as quite a good fodder, particularly for sheep.
7. Knot grass, *Polygonum aviculare*, a common European plant now widely spread as a weed in most temperate countries. The long tailing stems are rather fibrous, and are reputed to cause impaction in stock. We have never seen it eaten here in sufficient quantities to cause trouble.
8. A dock, *Rumex* sp.
9. See answer to D.S. (No. 7).
10. Yellow daisy, *Senecio lautus*. We have no particulars on the properties of this plant.

1. A variety of "everlasting," *Helipterum polyphyllum*.

12. New Zealand spinach, *Tetragonia expansa*, this plant is sometimes cultivated as a substitute for English spinach. It is reputed to be quite a good sheep fodder.
13. *Vittadinia australis*, sometimes called native daisy. Many of these native daisies are regarded as quite good fodders for stock.
15. *Cotula australia*, a weed prevalent on the Downs sometimes called native carrot. It does not, however, belong to the true carrot family, but we have several other plants which do, and to which the local name applies more correctly.
16. *Zinnia parviflora*, a native of tropical America now a very common naturalised weed on the Darling Downs. It is not known to possess any particular properties.

Scarlet Pimpernel.

W.S.G. (Barmundu, via Gladstone)—

The specimen is the Cape weed (*Cryptostemma calendulacea*). It is very common in some of the southern States, and covers acres and acres of ground. It has been established in Queensland for some years past, but never seems to spread here to the same extent it does in Victoria and South Australia. We have heard it spoken of in other States as a moderately good fodder, but we cannot say we have seen stock eat it here, at least to any extent. It is not known to possess any poisonous or harmful properties at any stage of its growth.

Western Plants Named.

E.M.B. (Jundah)—

1. The small reed—*Arundinella nepalensis.* This grass has a very wide distribution in Queensland from the coast to the interior. On the coast it grows mostly on forested hillsides and, generally, has a poor reputation as a fodder. Very often in the West these plants seem to become more palatable and this is evidently the case with the present species.
2. *Triraphis bromoides.*
3. *Triodia Basedowii.*
   Two very interesting grasses neither of which was previously recorded for Queensland, although we think Mr. Blake, the Walter and Eliza Hall Fellow at the University of Queensland, who has been studying western plants, has collected both of them.
4. *Ipomoea reptans.* We were very glad to get seeds of this plant.
5. *Acacia coriacea.* It was interesting to know you call this an oak. It is really a wattle, although very much like an oak in appearance.
6. Whitewood—*Atalaya hemiglauca.* We suppose you know that it has been accused in North Queensland of causing "walkabout" in horses. Its effect in the West on horses is probably familiar to you. Prominent veterinarians have told us that the "shivers" or "staggers" produced by this plant in the Central West is a form of the same trouble as "walkabout." In the more southern parts of the State and in New South Wales it seems quite harmless and an excellent fodder.

The grass you sent down some time ago as a winter fodder is a species of *Neurachne.* We think an undescribed species. Mr. Blake informs us that he has collected the same grass about Windorah.

Grasses and Clovers on the Eungella Range.

G.J.G.H. (Dalrymple Heights, via Mackay)—

There is no reason why paspalum and white clover should not be established on the Eungella Range although we did not see any good stands of it when we were there.

The average sowing of good paspalum seed would be 10 lb. an acre. The *Queensland Agricultural Journal* for September, 1937, contained an article by Mr. C. W. Winders on the establishment of paspalum, Rhodes, and Kikuyu pastures based on departmental experiences over a number of years.

In planting Rhodes grass 5 or 6 lb. of best quality seed to the acre is generally considered to be sufficient. It varies considerably in germination, so, perhaps a heavier sowing may be advisable. If you submit a representative sample to the department you will be advised as to the percentage of germination and rate of sowing.

Kikuyu is planted from cuttings which you may obtain locally. A cutting should consist of two or three joints, but can be less if desired, and placed about 3 feet apart.

We have placed the grasses in our order of preference, but this is purely individual opinion. The grass should not be planted near cultivation.

White Dutch clover, this is a perennial. One or 2 lb of seed to the acre may be included in the mixture and can be sown at the same time as paspalum or in the autumn.

Cluster clover, burr trefoil, and the English trefoil or black medic are annual clovers or trefoils that should do well on the Eungella Range and may act as a mother crop to the perennial white Dutch.

Darnel.

N.A.M'C. (Ubobo, via Gladstone)—

The specimen is Darnel or Drake (*Lolium temultenum*), a grass belonging to the same genus as rye grass. Darnel, in its young stages, is said to be quite suitable as a food for stock, but the grain is reputedly poisonous. It is not quite certain whether this poisonous principle is actually contained in the grain itself, or is due, in part at least, to a fungus commonly associated with it. In Europe, the plant is a common weed of grain fields and is said to have caused trouble when ground with wheat, rye, and other grains. Although the plant is moderately common in Australia, we have never heard of its causing trouble in any way.

Milky Bean. Scrub Wattle. Kurrajong.

J.A.T. (Julatten)—

1. *Alstonia villosa.* One of several trees in North Queensland known as milky pine or milky bean. We have no information on the fodder value of this tree.
2. Scrub wattle, *Acacia circinnata.* The leaves of several wattles are used in times of drought for fodder. We have no information about the present one, but the mature leaves would probably be very fibrous and have a constipating effect.

Of scrub trees used for fodder, the best are the Scrub Kurrajong or Brown Kurrajong (*Commersonia echinata*), a tree that comes up as secondary growth. It has rather large leaves, and in the stump or young stage, green underneath and the adult trees whitish, numerous white flowers followed by seed capsules covered by soft bristles. The tree frequently known as sarsaparilla, red ash, or silver leaf is another. This comes up often on cleared country following burns on the Atherton Tableland, Eungella Range, and other scrub areas. It is one of the best of the fodder trees.

Cape Spinach.

S.C. (Warwick)—

The specimen is the Cape Spinach—*Emex australis*—a native of South Africa now spread widely as a weed in many parts of Australia. In South Australia it is commonly called "saucy jack" or "prickly jack"; it also is called "bull head burr," although this name is applied to a number of burr pests in Queensland. The plant is not known to possess any poisonous or harmful properties, and the young leaves have been used as a substitute for ordinary spinach. It is, however, a very serious pest when it gets a hold in a locality. It has been established in Queensland for some years, but does not seem to spread here to the same extent as in the Southern States.

Plants from the Boonah District Named.

I.S. (Allandale, via Boonah)—

1. Plume grass—*Dichelachne crinita.*
2. *Chloris divaricata.* The Chloris family of grasses contains Rhodes grass and a number of native species. The native ones are commonly called windmill grasses.
3. Blue grass—*Dicanthium sericeum.*
4. Crow-foot—*Eleusine indica.* This grass is widely spread over the warmer countries of the world. Like sorghum it contains a prussic acid, yielding glucoside. Very few losses, however, occur from it in Australia.
5. Tussock grass—*Poa australis.*
6. Early spring grass—*Eriochloa* sp. Various species of Eriochloa are familiarly known as early spring grass. This name is not particularly appropriate as they are no earlier than several other grasses which come up with the spring rains.
7. *Paspalidium distans,* a native paspalidium grass which is generally regarded as a good fodder.

Paspalum is a native of South America.

Indian Laburnum. Siris Tree.

W.A.B. (Cloncurry)—

1. Indian Laburnum, *Cassia fistula,* a native of India, but now widely cultivated in many tropical and subtropical countries. It is one of the Cassias grown in Honolulu under the name of golden shower. It is commonly called cascara bean or cascara tree in North Queensland, and the sweetish pulp surrounding the seeds is eaten as a milk and safe laxative. It has really no connection with the true cascara of commerce, which is the product of a tree of the family Rhamnaceæ. The Indian laburnum belongs to the same genus as several shrubs which produce the senna leaves of commerce.
2. The Siris tree, *Albitzia lebbek,* a native of India, but now widely spread either naturalised or as a cultivated tree throughout the tropical and sub-tropical parts of the world. It is very extensively planted in North Queensland as the commonly called acacia. It is not a member of the genus acacia, although it is very closely allied to it. The genus acacia includes the Australian wattles.

Rural Topics

Achievement its Own Reward, What!

Farmers, like poets and philosophers, are supposed to get so much fun out of doing the things they want to do that they can go on living on the joy of achievement—or, perhaps, like a ghost, on fresh air. All very beautiful in theory, but like love on intermittent relief, rather apt to fade out in actual experience. Of course, one must have "the right spirit" for both farming and matrimony, but in our modern, matter of fact, and mechanical age the "spirit," no matter how willing, is not enough. Certain fundamentals of successful husbandry—men, money, machinery, and markets—must not be overlooked.

British Commonwealth co-operation as visualised by the Empire Producers' Conference in Sydney may be an indication that the "Promised Land" of sane economy is not so very far away after all.

Soft Fat in Bacon Pigs.

The fat laid down by bacon pigs bears some relation to the fat in the diet.

Liquid fats are termed oils, and when these form an appreciable part of the pig's diet soft, oily carcases result.

Seeds with a high oil content—e.g., peanuts—should not be fed. Those with medium oil content—e.g., seed cakes and meals (linseed meal, cotton seed meal, &c.)—should be fed in moderation and discontinued at least one month prior to slaughter.

Low oil content seed cakes and meals (solvent extracted) may be fed with safety.

Unsung, but not Forgotten!

There are modest, industrious, kindly men and women in every community who lead such exemplary lives that they have to die to get more than a personal mention in their home-town newspapers. Just goodness—for some inexplicable reason—isn't news!

Mayhap there's something perverse about that, but this is a perverse world. Even editors are perverse. We may moralise and philosophise in our odd moments, but primarily we have the instincts of the lowest cub reporter—we are newsivorous. The unusual is our food and drink—our respite from the monotony of daily chores. The unusual is news!

But to-day we doff our hats to all whose names have not appeared in our pages during the year just ended. They are, perhaps, our best citizens! They are the men and women who rear children without appearing in the juvenile court; the workers who disappoint us by failing to go on strike; the churchmen who never go wrong; . . . . the solid, homespun citizenry who work hard, suffer much, pay their taxes, meet their obligations and still have faith in their home town and their homeland.

They may be unsung, but they're not forgotten. In Heaven, we know, they'll get front-page mention. Here's to our rank and file citizenry!—*The Citrograph* (California).

The Live Stock Market Outlook.

The Queensland Meat Industry Board strikes a note of optimism in a report on the outlook of the industry, and in which it is stated that there is plenty of room for expansion in the production of beef, pork, and lamb. The fact that problems associated with the industry are being studied scientifically encourages the belief that the outlook for the future is substantially sound.

Market Rivals?

That Australia is likely to prove New Zealand's most hefty rival on the primary produce market was the view expresed at the last meeting of the Wellington branch of the Economic Society by a well-known New Zealand agricultural science worker who had just returned from a tour abroad. In a summary of his travel impressions, he said that Australia is marketing the same kind of primary products as New Zealand, and is gradually overcoming the problems that had restricted her efforts in the past. "For a long time Australia has been wool and wheat-minded, but now is going in extensively for fat lambs," he said. From what he had been told at Smithfield, Australian fat lambs are excellent in quality. More efficient farming on more efficient acres is the winning policy.

Orchard Notes

JANUARY.

THE COASTAL DISTRICTS.

ALL orchards and plantations should be carrying a good cover crop which will help to check erosion during the wet season and maintain the soil in good physical condition when cut and turned under.

Pineapple plantations should be kept well worked.

Bananas and pineapples may still be planted, though it is somewhat late for the former in the more southern parts of the State. Keep a good lookout for pests of all kinds, such as Maori on citrus trees, scale insects of all kinds, all leaf-eating insects, borers, and fungus pests generally, using the remedies recommended in Departmental publications.

Care is advised in handling and marketing of all kinds of fruit.

Grapes are in full season, and in order that they may be sold to advantage they should be very carefully handled, graded, and packed, as their value depends on the condition in which they reach the market. Well-coloured, mature fruit, with the bloom on and without blemish, always sells well.

One of the greatest mistakes in marketing grapes is to send the fruit to market before it is properly ripe. A maturity standard for grapes is now in force, and immature grapes are liable to condemnation.

Bananas for the inter-State trade should be well filled but showing no sign of ripening. The fruit should be carefully graded and packed and the cases marked in accordance with the regulations under the Fruit Cases Acts and despatched without delay.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JANUARY is a busy month in the Granite Belt, and orchardists will be fully occupied gathering, packing, and marketing the crop of midseason fruits.

Much of the fruit may not carry far beyond the metropolitan market, but firm-fleshed plums, clingstone peaches, and good firm apples should stand the journey to the Central District; and, if they are carefully selected and properly graded and packed, they should carry as far as Cairns.

Points to remember:—

The fruit should be fully developed, but yet quite firm when gathered.

It should be handled carefully. Bruised fruit is spoilt fruit.

Only one-sized fruit, of an even degree of ripeness and colour, should be packed in a case.

The fruit should be so packed that it will not shift, for if it is packed loosely it will be so bruised when it reaches its destination that it will be of litle value. At the same time, it must not be packed so tightly as to crush the fruit.

GREEN MANURING OF CITRUS TREES.

A green manuring experiment extending over thirteen years at the Commonwealth Research Station at Griffith, New South Wales, has shown that the growth of a winter green manure crop (tick beans) increased the growth and yield of trees compared with trees kept clean cultivated. The growth of a summer green manure crop (cowpeas) at first decreased the growth and yield of the trees because of the competition of the cowpeas for soil moisture during the summer; after about ten years, however, the trees on the cowpea plots caught up to those on the clean cultivated plots.

Farm Notes

JANUARY.

THE heaviest rains of the year normally occur during the January-March period, and, weather conditions permitting, the main field activity for the month will be the preparation of land for autumn and winter crops, together with the scarifying and chipping required for existing row crops.

In all districts where wheat, barley, canary seed, and oats have been harvested, ploughing should be continued in order to conserve moisture for the succeeding crop, and to eradicate troublesome summer weeds.

Early ploughing permits the accumulation of subsoil moisture, which is invaluable in promoting the growth of winter cereals at a time when seasonal rainfall is often deficient. The practice of early ploughing is recommended, especially to dairymen outside the wheat areas who normally sow oats, barley, and wheat for green feed.

Land intended for the February potato planting will now be in an advanced stage of preparation. The selection of whole seed from disease-free crops is recommended for autumn planting, as losses may occur from rotting if hot, wet conditions prevail after the planting of cut sets. Very small whole potatoes, less than 2 inches in diameter, are not likely to give the same results as more robust potatoes.

Succession sowings of summer fodder crops—such as sorghum (saccaline, white African, and imphee), Sudan grass, white panicum, Japanese millet, and cowpea may be continued where land is available. Maize sowing may also be completed in districts where early frosts are not the usual experience, but preference should be given to early-maturing or mid-season varieties.

Full advantage should be taken of the opportunity to arrange for the adequate conservation of fodder during the summar growing season, when the production of bulky, green crops presents no great difficulty.

Well-grown crops of maize and the sweet sorghums cut at the right stage of growth and before full maturity will make excellent sileage which can be economically conserved in pit, trench, stack, or overhead silo. Surplus green grass, and many other green crops, will also make satisfactory sileage for winter feed, and as a reserve for dry periods. Many dairymen prefer to rely on a continuity of green fodder crops throughout the year, but provision also should be made for conservation, for if pastures are scarce because of dry conditions, crop growth is then also at a minimum.

January is usually a favourable month for the sowing of paspalum, Rhodes, and other summer grasses in districts suitable for their growth. Recently burnt scrub land or thoroughly cultivated areas provide a good seed-bed, given sufficient moisture, but care should be taken to ensure that the germination standard of the seed is sufficiently high, as a good cover and rapid early growth is the principal factor in keeping weeds and undergrowth in check.

All harvesting machinery should be placed under cover. Repairs and adjustments may be regarded as wet-day jobs.

THE NEED FOR A PLANNED ECONOMY.

Over and over again it has been prophesied that the world would one day become unable to feed its people. In fact, some prophets have actually gone so far as to fix the year of universal famine. About forty years ago the present year, 1938, was selected by one then accepted authority as the year when the world might not be producing enough to feed its population. The real position is that unless we increase consumption by properly feeding those who are under-nourished we are over-producing many agricultural commodities.

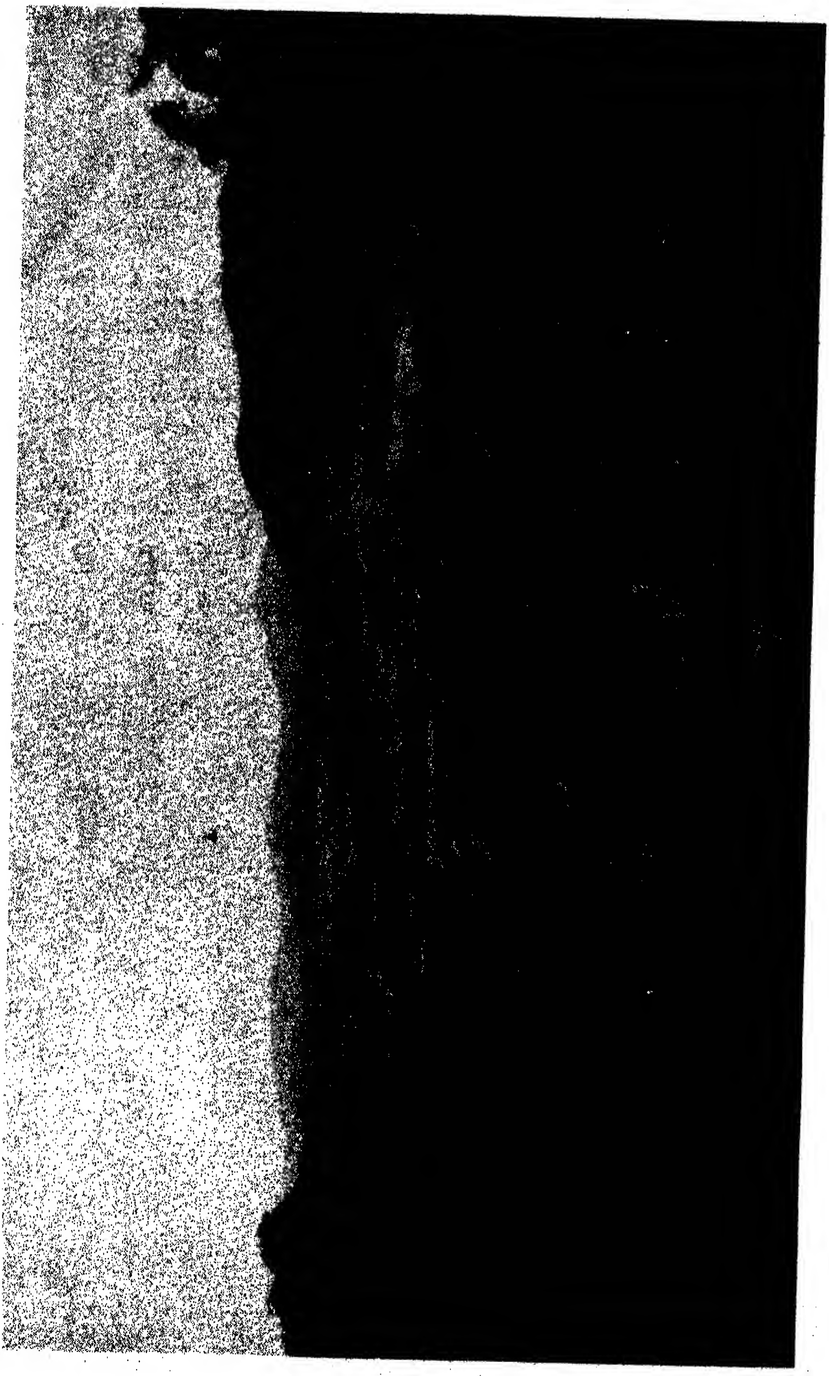


Plate 235.

Fertile farming lands in the Sarina Valley, Mackay District, Queensland.

[*Photo.: J. Lunn, Lands Department.*

Plate 236.

Where the mountains come down to the sea. A scene on a coastal road near Innisfail, North Queensland.

Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

OVERSTIMULATING OUR BABIES.

A MOTHER writes:—"My baby is just one month old, entirely breast fed, and is gaining weight steadily. He seems content and sleeps nearly all the morning after his bath and feed. Is there any objection to my taking him for a motor run in the afternoons?"

We informed the mother that we considered it unwise to take him for outings in the motor car. A quiet ride in his perambulator would be better. In these days there is a danger of overstimulating our babies. This happens especially in the case of the first baby. The baby is exhibited to everyone who visits the home and to others met outside. The proud father may be more at fault than the mother. There is a temptation to handle him too much, to pat his cheeks, to chuck him under the chin, to snap the fingers and make those noises which fathers excel in making. This behaviour on the part of the parents and attendants continues until the infant responds by laughing or by making impulsive movements which delight the onlookers.

Children who are stimulated in this way tend to become restless, irritable, and discontented. If the child is naturally highly strung his digestion may be upset and his nutrition may suffer seriously. Many babies who have been recently fed regurgitate their food as the result of being excited or carelessly handled by mothers or nurses. A child may be sat up gently immediately after or in the middle of a feed to enable him to "bring up wind," but once this is done he should be placed in his cradle and not be jogged up and down, rocked, or fondled.

Quite often the digestion of a baby has been upset and vomiting has been induced by the mother or nurse thoughtlessly swinging him to and fro with his face downwards and his body across her knees, rocking him side to side and patting him on the back.

Mothering.

We do not believe that infants should be allowed to lie passively unnoticed in their cots. The bad effects of this treatment are noticed in children who have been confined to bed in a hospital for a long time suffering from a chronic form of illness. The only occasions on which these children may be disturbed are when the nurses require to administer treatment, much of which the infants resent actively or passively. Such infants may develop a condition of limpness, inertion, boredom, and lethargy in which they cease to exhibit any interest in their food or surroundings. They cease to possess the desire or will to live. The mothering of these infants may be the turning point in their recovery. Sick children require to be mothered.

Mothering comprises an attitude of unobtrusive friendship, good will and love on the part of the mother, nurse, or attendant towards the child. In response to this the child loses his fear of his surroundings, gains confidence, and feels that all is well. A smile, or a kindly softly-spoken word when a mother is passing the child's cot as he lies awake, makes all the difference to him. After the morning's bath, feed, and sleep he may be taken out of his cot or placed in a position near where the mother is working.

The midday meal over, preparation is made for his afternoon outing. If possible, let this outing be made in restful surroundings, away from the noise and bustle of traffic. Avoid taking your baby into crowds. On returning home, put him down to rest quietly after his evening meal.

It is well if the mother, however busy her life, is able to carry out the various activities associated with the care of her baby in a calm, quiet, and deliberate manner, free from fuss and excitement.

COMMON FAULTS IN CHILD FEEDING.

(Contributed by the Queensland Nutrition Council.)

One year of good feeding before the child is five years old, is worth more than ten years of good feeding after the child has reached adult age.

Many mothers, if they were asked if their children were fed properly, would insist that they got the best of everything, and yet if one went carefully into the children's daily life habits, one would find many faults.

Now let us discuss shortly the common faults which one finds in childhood feeding. The three commonest causes of malnutrition in children are, firstly—The diet is insufficient in amount. Secondly—The wrong kinds of foods are eaten, and thirdly—Bad food habits.

Let us take those in order. Firstly—There is insufficient food eaten. Now the essence of childhood is activity, every movement the body makes, every little bit of work the body does requires nourishment.

and this can come from but two sources—the food that is eaten, or from the body itself. If the food that is eaten and made use of is not sufficient for those needs, the body sacrifices itself to make good the deficiency. Now one of the commonest causes of the child not having enough to eat is a poor breakfast. Studies have shown that many children have no breakfast at all, or else a more scanty apology for a breakfast such as tea and toast, and toast made from white bread at that. It is amongst the very poor people that this serious situation is most common. The custom in poorer homes is to have only one real meal a day; that is at night, when father comes home from work. In the meantime, the children get along as best they can with snacks of bread and jam and cups of tea. In the worst cases, the mothers go out to work as well, and leave the children in bed to get up and eat what they can find before they scramble off to school.

Poverty is not the only cause of this sad state of affairs, because the no-breakfast habit is quite common amongst all groups of the community, and in many cases it is due, not to lack of food, but the child's failure to eat it.

Now why is it that children suffer from lack of appetite in the morning? In some cases it is purely a bad habit, but there are other causes as well. For instances, a bad taste in the mouth in the morning can be caused by diseased teeth, tonsils, adenoids, or the coated tongue that results from constipation; this bad taste may often account for a lack of desire for food. An indigestible evening meal, or a stuffy bedroom which leaves a child listless and far from refreshed in the morning may also result in a child's being disinclined to eat. Or perhaps it is because the child gets up too late. The interval between getting out of bed and breakfast is, at any rate for the city child, usually far too short for an appetite to develop. Children in the country who are up for an hour or so before breakfast, helping with the daily duties of the farm, rarely fail to develop a normal appetite at breakfast time. Amongst older children, especially girls of school age, going without breakfast often becomes a fad which rapidly spreads over a whole school, and is no doubt responsible for much of the physical weakness and inefficiency at this period.

Perhaps the commonest cause of no breakfast is the feeling of hurry, which possesses most children in the morning. Because of a late bedtime the night before, the child gets up late and must hurry to get to school in time. Breakfast must be eaten straight away, and hurriedly, if at all. He has no desire for food, he is coaxed or forced by his mother to eat "a little something"—a mouthful of porridge, a cake, a cup of tea, or toast made from white bread—and off he rushes to school He has robbed his body of one-fourth to one-third of the day's needed nourishment, and the chances are not very great that he can make up for it in the middle of the day. On the contrary, he is likely to become over-hungry and over-tired, and may eat even less than if he had had a proper breakfast.

Few people realise that starting the day without breakfast, or with only tea and toast, can be a cause of complaints such as headaches, indigestion, and constipation. Much inefficiency in school may be due to poor breakfasts.

So from breakfast we pass to lunch time. Children who come home to lunch either because of the fear of being late for school, or because of their desire to get back to play, will, if allowed, only eat enough to stay the most insistent hunger pangs, or bolt whatever mothers think they should have before they hurry back to school.

Children who live too far from school to go home must carry lunches, or buy the lunches at school. Many children are given a penny or threepence to buy their lunch. If you are passing the school tuck shop around lunch time it will be interesting to note just what the children really do buy—saveloys, ice cream, chocolate-sticks, white bread sandwiches, or other odds and ends picked up at random to be eaten as they dash off to continue their play. At one school where the scholars all come from well-to-do and comfortable homes, a lunch survey of 200 children showed that only 14 per cent. had lunches which were adequate in quantity and quality of food, but the lunches of over half of them were plainly too small in amount, and were otherwise lacking in the essentials of a child's diet.

Given a free choice, children without training naturally select the foods which they regard as luxuries. One boy's lunch for several weeks of the year, consisted of ice cream, a saveloy, and a stick of chocolate. Most of the children were given money enough to buy a good lunch if it had been suitably spent, but they purchased too many expensive foods or saved their lunch money to buy sweets after school.

Among school children, both breakfast and lunches are likely to be skipped, and this is specially unfortunate as it means that a child goes from dinner one night until the same time the next day without any real meal. It is unwise, even if it were possible, for a child to eat almost his whole day's requirements at one meal at night.

Growing children have a tremendously high need for the right foods—milk, fruit, vegetables, meat, potatoes, cheese, butter, eggs, and wholemeal or wheat germ bread are what the child needs for proper nutrition and development. Many mothers blame rapid growth for the thinness of their children, but more often than not it is due to insufficient nourishment Much of the food that is served to the child is so unattractive, and unpalatable, that no one would eat it unless driven to do so by extreme pangs of hunger. This is possibly a relatively unimportant factor in this diet problem of childhood, but it does certainly exist.

Then we come to the factor of the wrong choice of food, and here the outstanding fault in Queensland is too little milk. Milk is the only dependable source of lime which is needed in large amounts for the growth and development of the teeth and bones. The idea to be aimed at is somewhere about a quart of milk for the growing child every day, and one pint of milk a day has long been accepted as the absolute irreduceable minimum which should be considered.

In a study made of young children at school, it was found that only 20 per cent. were getting as much as a pint of milk a day, and over half were having no milk at all to drink.

Few mothers realise the importance of milk to a growing child, and even in farm homes, where milk is plentiful, no effort is made by the mother to see that the child drinks it regularly. In poorer homes the

mother thinks that she cannot afford milk, and when the child is old enough to eat solid foods she leaves out the milk and replaces it with tea because it is cheaper. In the more comfortable type of home the child is given so many highly flavoured and heavily sweetened foods, that the child refuses the milk because it has such a bland, mild flavour. It is usually a safe guess that when a child refuses milk and other plain foods, the diet is unbalanced in other ways.

The next commonest feeding fault is the giving of too few vegetables. The scanty use of vegetables is very widespread amongst poorly nurished children. Vegetables are not quite as indispensable in the diet of children as is milk, but it is very difficult to plan a perfect diet for childhood if vegetables and fruits are excluded. Many children dislike vegetables, but this dislike is largely due to the failure on the part of the parents of beginning early to teach the children to like them, and of gradually accustoming them to the special flavours which vegetables impart to the daily food.

The third commonest fault in daily food habits is that of taking too many sweet foods. Too much concentrated sweet foods are accepted by all nutrition workers as a cause of faulty nourishment. The most serious effect of sweet foods is that of lessening or destroying the appetite for milk, vegetables, and other important foods, and of crowding them out of the diet. When the child's appetite is dulled by sweets, there is not, as a rule, a desire for the mild bland foods like milk and vegetables, so that foods, to make an appeal, must be highly flavoured and highly sweetened.

When sweet foods push the milk and vegetables out of the diet, along with the milk and vegetables go a great part of the proteins, lime, iron, and other minerals and vitamins which are so essential for growth. The loss on but one day will probably not be a serious matter, but if it is repeated day after day, with breakfast, luncheon, and dinner robbed in this way (as it is with many children) the effect cannot be anything but disastrous.

IN THE FARM KITCHEN.

SALADS FOR EVERY DAY.

IT is quite wrong to suppose that salad made with raw or cooked vegetables should be used only in summer. The nutritional needs of the body are just as important in winter as in summer, and much of the so-called spring sickness of the older days was probably due to the custom, quite a wrong one, of not using fresh salad vegetables and fruit during the winter months. Salads of fresh vegetables and fruit therefore hold a high place among foods if one wishes to achieve a balanced diet.

Now, there are two classes of salads, those made with raw and those made with cooked vegetables. First of all there are a few secrets in the preparation of raw vegetable salads which are provided by the cookery expert of the Queensland Nutrition Council. Lettuce, of course, frequently forms the foundation of raw vegetable salads, other vegetables used are tomato, cucumber, radish, celery, grated beetroot, grated raw carrot, and even raw grated white turnips, or shredded raw cabbage. These salads are served on individual lettuce leaves with cream or salad dressing. Some people like to rub the salad bowl with a piece of cut garlic or onion in order to impart flavour to the salad. Onions are a very delightful addition to salads, but you must remember the old joke about the onion which said that while onions built one up physically, they drag one down socially. Finely chopped meat

like lamb, ham, tongue, chicken, cold cooked fish, salmon, prawns, or crab may be added to raw vegetable salads. Lettuce once it has lost its crispness is, of course, not as good as fresh lettuce but if you cannot get fresh crisp lettuce you can improve the appearance of the lettuce when it has become somewhat limp by soaking it in as cold a water as possible without salt. By this means, the leaves will become a little more crisp. After washing, all lettuce leaves must be dried thoroughly with a clean cloth.

So much for the raw vegetable salads. Now the cooked vegetable salads are made from cooked cold vegetables such as potatoes, peas, beans, carrots, cauliflower, turnips, or parsnips. Boiled lima beans or haricot beans or french beans are very nice when served on a lettuce leaf with french dressing. The point about cooked vegetable salad is that the vegetables should be cut into small uniform squares and arranged carefully in a salad bowl, a glass dish, or on lettuce leaves. Cooked beetroot may be served alone with its vinegar.

In the preparation of chicken salad, take the remains of a cold fowl and mince it rather coarsely, heap this minced fowl into a small mound built on to some finely cut or shredded lettuce, and covered neatly with some well cooked green peas or grated raw carrot. Over the top of everything pour some plain salad dressing.

Cabbage salad is another suggestion. For this you require a cup of firm white cabbage, finely shredded, a large apple, 3 sticks of celery, salad dressing, pepper and salt, a little finely shredded lettuce. Half a pineapple may be used instead of the apple and lettuce. First wash and dry, and finely shred the cabbage. Cut the apple and celery into dice or grate the pineapple, and season with a little pepper and salt. Arrange in layers in small individual glass dishes or plates, sprinkle each layer with a pinch of pepper, salt and sugar, put a little finely shredded lettuce on the top and serve with salad dressing.

Now for a beetroot or tomato salad. For this you will require 3 beetroots, or 3 tomatoes, ½ cup of vinegar, ½ cup of water, 2 cloves, 12 peppercorns, a small piece of mace, 1 teaspoon of salt and a dessertspoon of sugar. Put the vinegar, the cloves, the mace, the salt, the sugar, and the pepper corns in an enamel saucepan and bring it to the boil and simmer for three minutes. Stand on one side until cold, then peel and slice the beetroot and arrange daintily in a glass dish, pour the cold spiced vinegar through a strainer over the beetroot and tomatoes. Now for some rather more ambitious salads—asparagus salad. For this you will require 1 tin of asparagus, lettuce leaves, salad dressing, slices of hard-boiled egg and parsley. Drain the asparagus free from its liquid and place the stalks in an ice chest for an hour. Lay six stalks on a lettuce leaf and cover the tips carefully with a good salad dressing just before serving. Place a very thin half slice of egg on each side and touch with a little piece of parsley. Several stalks of asparagus may be placed through a thin ring of tomato or lemon free from pulp.

Here is another suggestion, a grapefruit salad. Take 4 grapefruit shells, 1 oz. of chopped walnuts, 1 large apple or a small pineapple, grated carrot, 4 stalks of white celery, 1 teaspoonful of lemon juice, some nice lettuce leaves, and a good salad dressing. First of all peel the apple and cut it into small dice, grate the carrot and mix with the lemon juice, shred the celery very finely, add the walnut and mix the ingredients lightly together. Fill the grapefruit shells and serve on a dish on either shredded lettuce or young lettuce leaves, and over it all pour salad dressing. This may also be served on a slice of pineapple, lay it on a crisp lettuce leaf with a teaspoon of whipped savoury cream on the top.

Potatoes are very valuable in the daily diet. The League of Nations Nutrition Committee reported that the use of potatoes as a basic food should be increased, and it could with advantage replace much of the white flour, bread and cakes in the diet. Now if you cut a raw potato across with a sharp knife and look at the surface, you will see three distinct layers. There is, firstly, the thin outer skin, secondly a broader layer inside the skin, and thirdly the flesh of the potato which makes up the rest of its bulk. The importance of recognising these three layers lies in the fact that they differ considerably in chemical composition. The part of the potato just under the skin is considerably richer in mineral matter and proteins than the flesh, and in peeling it off with the rind these valuable ingredients are lost. So if you wish to get the best value from potatoes boil them in their jackets, even though they be peeled before serving. Actually the peel itself, if clean and well scrubbed before being boiled has no particular disadvantage; indeed, it

forms a convenient source of roughage in the diet. Undoubtedly, an enormous amount of waste takes place in nearly every home in the potato peelings that are thrown out. So when making potato salad, boil your potatoes in their jackets and peel and slice them when cold.

Another suggestion for a valuable food that can be built into a salad is cheese. Now cheese deserves a far more prominent place in the diet throughout the year. Cheese is one of the most economical ways of taking milk. The Australian eats only half the amount of cheese that the Britisher does, and even the British eat much less of this valuable food than they should. Of the high nutritive value of cheese there can be no doubt, and it is just what one would expect when one remembers that 1 lb. of cheddar cheese represents the total protein, and most of the fat in a gallon of milk. So mix some thin slices of diced squares of cheese into your salads, and it will enrich the flavour and nutritive value. You can make quite a tasty salad out of small dices of cheese with finely chopped raw apple mixed with it. Now, it will be said that the apple will go brown, but not if you know the secret, and that is to pour some lemon juice over the apple as soon as it is chopped up. That will prevent the apple from going brown.

Many of these suggestions for salads can be used for the preparation of savouries. The highly coloured fancy sweet cakes for party purposes are now out of date. In their place are seen savouries which have a much higher nutritional value. They stimulate the appetite instead of destroying it, as the sweet cakes do. When the Queensland Nutrition Council had its annual meeting early this year a savoury supper was served to show what could be done. An extensive variety of thin slices of tomato, sprigs of parsley, prawns, asparagus tips, a few shreds of lettuce, squares of cheese, minced cold chicken were built on to thin crisp slices of fried potatoes.

PRESERVATION OF BIRD LIFE—A PLEA.

At this time of the year, when birds are nesting, an earnest appeal is made to all to become interested actively in the preservation of wild bird life. The value of birds in our rural economy is incalculable. It has been well said that the service that birds render in protecting forest trees "is more nearly indispensable to man than any other benefit they confer on him. Were the natural enemies of forest insects annihilated, every tree would be threatened with destruction, and man would be powerless to prevent the calamity. He might make shift to save some orchard or shade trees; he might find means to raise some garden crops; but the protection of all the trees would be beyond his powers. Yet this herculean task ordinarily is accomplished as a matter of course by birds and other insectivorous creatures without trouble or expense to man."

During the grasshopper plague last year, many thousands of starlings were to be seen feeding on the insects, but starlings were not alone in their assault on the common enemy. Every insectivorous bird fed to satiety on the hoppers. The indiscriminate shooting of bush birds has, therefore, nothing to commend it from any point of view.

Fortunately, very few native birds are not protected legally, but even the despised crow is a friendly ally in the continuous war against insect pests. Crows eat grasshoppers and it takes a lot of hoppers to fill the craw of a crow. The crow also is energetic scavenger. It eats carrion and maggots. From maggots come blowflies, and the loss to Australian woolgrowers caused by blowfly infestation runs into millions of pounds annually.

FLEA INFESTATION.

With the coming of warmer weather, reports are reaching the Department of the infestation of dwellings, gardens, and other places by fleas. There are three species of fleas which may be responsible, namely, the cat flea, the dog flea, or the "human" flea. Usually the species prevalent in the cities is either the cat or dog flea, whilst at the seaside, the "human" flea, or sand flea as it is sometimes called, is often rife.

Fleas become a nuisance only when conditions are suitable for them to breed. The female flea, which is much larger than the male, lays eggs which drop off into the ground and hatch into maggots. The maggot feeds on certain substances in the dust and eventually become a pupa. From this pupa the adult flea, in time, emerges and immediately searches for a host on which to feed. When conditions are warm and dry with a good accumulation of dust, fleas breed rapidly.

Control of fleas is not difficult, and if properly carried out, the nuisance will rapidly disappear. Such measures include:—

(1) Dogs and cats should receive a thorough dusting with a good pyrethrum or derris dust. The dust should be worked down to the skin. In a few minutes the fleas will crawl out of the coat and fall off. The animal should be stood on a sheet of paper while being dusted. After all the fleas have fallen off on to the paper it should be rolled up and burnt.

In the case of dogs, a wash in soapy water to give a good lather will kill all the fleas. This is not as effective as dusting, as the derris or pyrethrum prevents reinfestation for some time after application.

(2) Where the infestations involve outhouses, underneath the house, &c., all litter should first of all be cleaned up and burnt. The ground should then be thoroughly soaked with water and kept wet for about two weeks. This will kill the maggots and pupæ in the soil.

(3) Where dwellings are infested it would be desirable—

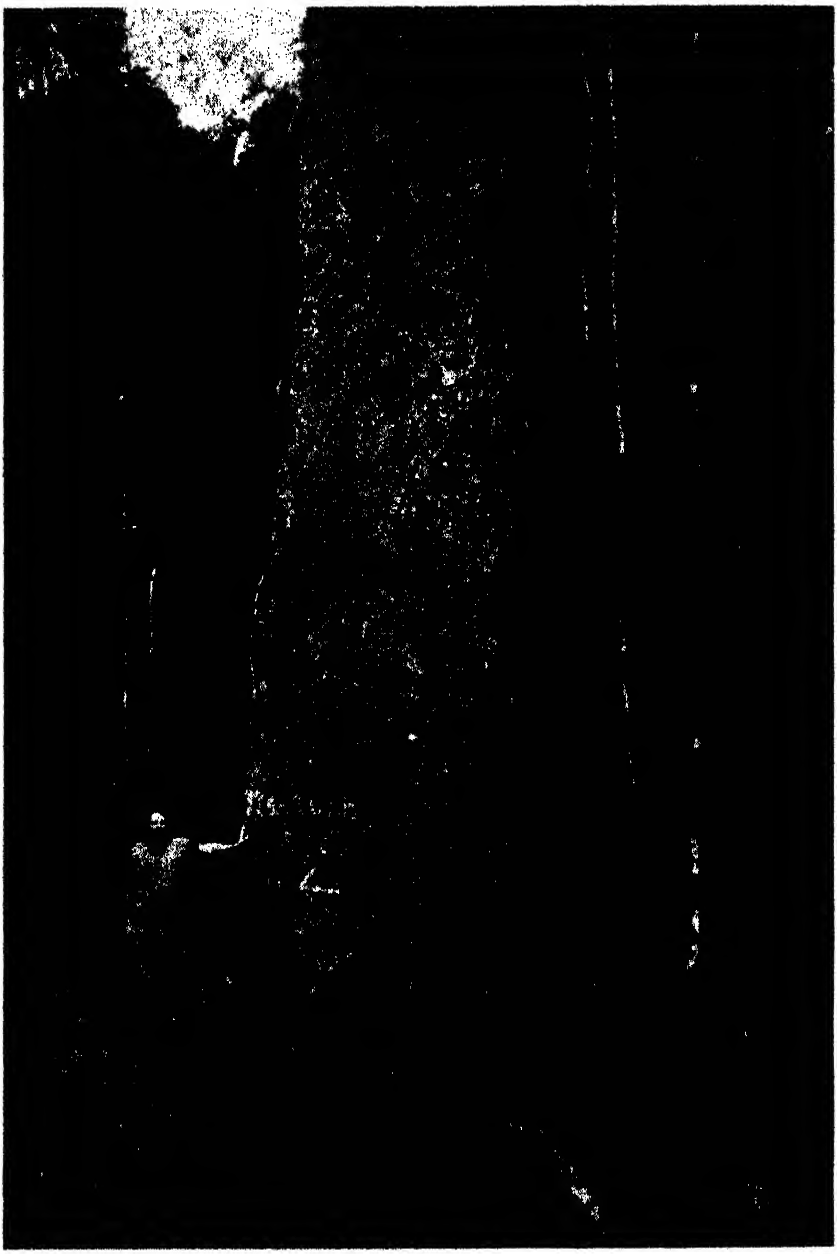
(*a*) To take all rugs outside the house, shake well, and hang in the sun for a day.

(*b*) If a vacuum cleaner is available, go thoroughly over all floors and furniture. Burn the dust.

(*c*) Spray thoroughly with a good spray, forcing the spray into all cracks and crevices. Where there is little risk of fire, petrol may be used for this purpose.

(*d*) After cleaning the house, sprinkle naphthalene under the rugs, &c.

More than one treatment may be necessary where houses are very badly infested.



[*Photo.: J. Lunn, Lands Department.*

Plate 237.

A Rain Forest Giant, Dunbulla, North Queensland.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF OCTOBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1938 AND 1937, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1938.	Oct., 1937.
North Coast.	In.		In.	In.
Atherton	0·92	37	1·77	0·21
Cairns	2·10	56	4·30	0·03
Cardwell	2·02	66	1·38	0·06
Cooktown	1·03	62	1·38	0·75
Herberton	0·97	52	1·10	0·14
Ingham	1·86	46	1·97	0·02
Innisfail	3·22	57	5·31	0·55
Mossman Mill	2·91	25	3·49	0·18
Townsville	1·31	67	0·75	0·09
Central Coast.				
Ayr	0·91	51	1·37	0·22
Bowen	1·01	67	0·92	1·13
Charters Towers	0·72	56	1·77	0·67
Mackay P.O.	1·72	67	2·43	2·29
Mackay Sugar Experiment Station	1·47	41	..	1·54
Proserpine	1·62	35	1·85	2·05
St. Lawrence	1·80	67	1·41	3·63
South Coast.				
Biggenden	2·46	39	2·35	4·52
Bundaberg	2·12	55	2·99	3·64
Brisbane	2·55	86	3·45	3·59
Caboolture	2·59	51	4·61	7·16
Childers	2 76	43	2·66	5·46
Crohamhurst	3·31	45	6·85	5·06
Esk	2·64	51	2·60	10·13
South Coast—contd.	In.		In.	In.
Gatton College	2·05	39	..	5·37
Gayndah	2·41	67	3·10	3·69
Gympie	2·73	68	3·12	4·93
Kilkivan	2·65	59	4·50	4·80
Maryborough	2·74	67	4·25	1·81
Nambour	3·21	42	4·18	8·76
Nanango	2·25	56	2·96	2·47
Rockhampton	1·78	67	3·36	2·27
Woodford	2·63	51	1·91	7·32
Central Highlands.				
Clermont	1·30	67	1·60	0·32
Gindie	1·37	39	..	1·38
Springsure	1·64	69	2·65	1·06
Darling Downs.				
Dalby	2·06	68	2·42	3·41
Emu Vale	2·18	42	2·79	2·89
Hermitage	1·88	32	..	2·39
Jimbour	1·87	50	2·72	1·50
Miles	2·02	53	4·14	2·11
Stanthorpe	2·52	65	2·15	1·72
Toowoomba	2·58	66	3·06	4·70
Warwick	2·31	73	4·26	3·81
Maranoa.				
Bungeworgorai	1·47	24	0·72	0·74
Roma	1·74	64	1·85	0·96

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—OCTOBER, 1938.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·96	85	71	88	25	62	7	138	5
Herberton	..	79	60	85	10, 14, 24, 25, 26	51	16	110	6
Rockhampton	30·07	84	64	92	27	58	21	336	6
Brisbane	30·12	79	61	86	26	56	19	345	8
Darling Downs.									
Dalby	30·08	84	58	91	2	49	17	242	8
Stanthorpe	..	76	50	84	20, 22	39	18	215	8
Toowoomba	..	77	55	86	21	46	19	306	8
Mid-Interior.									
Georgetown	29·95	96	66	102	28	57	25	2	1
Longreach	29·97	94	63	104	30	50	15	16	1
Mitchell	30·02	88	60	96	9	50	19	131	5
Western.									
Burketown	29·94	93	70	100	27	63	25	243	1
Boulia	29·88	94	64	107	29	50	11	101	2
Thargomindah	29·96	91	64	100	4, 20, 22, 29	51	24	23	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

	December, 1938.		January, 1939.		Dec., 1938.	Jan., 1939.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	4·49	6·31	5·0	6·50	12·25	1·56
2	4·49	6·32	5·1	6·50	1·21	2·55
					p.m.	
3	4·49	6·33	5·1	6·50	2·16	4·2
4	4·50	6·34	5·2	6·51	3·15	5·4
5	4·50	6·35	5·3	6·51	4·17	6·4
6	4·50	6·36	5·3	6·51	5·17	7·0
7	4·50	6·37	5·4	6·51	6·24	7·52
8	4·50	6·38	5·5	6·52	7·27	8·29
9	4·51	6·38	5·5	6·52	0·23	9·22
0	4·51	6·39	5·6	6·52	9·16	10·3
11	4·51	6·39	5·7	6·52	10·4	10·42
12	4·51	6·40	5·8	6·51	10·45	11·21
13	4·52	6·40	5·9	6·51	11·26	..
					a.m.	a.m.
14	4·52	6·41	5·10	6·51	..	12·2
15	4·52	6·41	5·11	6·51	12·4	12·44
16	4·52	6·42	5·12	6·50	12·44	1·28
17	4·53	6·42	5·13	6·50	1·22	2·14
18	4·53	6·43	5·13	6·50	2·1	3·3
19	4·53	6·43	5·14	6·50	2·44	3·55
20	4·54	6·44	5·15	6·49	3·30	4·48
21	4·54	6·44	5·16	6·49	4·17	5·38
22	4·55	6·45	5·17	6·49	5·7	6·39
23	4·55	6·45	5·18	6·49	5·59	7·22
24	4·56	6·46	5·19	6·48	6·25	8·12
25	4·56	6·46	5·19	6·48	7·43	9·8
26	4·57	6·47	5·20	6·48	8·31	9·56
27	4·58	6·48	5·21	6·47	9·26	10·52
28	4·58	6·48	5·22	6·47	10·18	11·46
29	4·59	6·49	5·22	6·47	11·10	..
						p.m.
30	4·59	6·49	5·23	6·46	12·4	12·44
31	5·0	6·50	5·24	6·46	1·0	1·56

Phases of the Moon, Occultations, &c.

7th Dec.	○ Full Moon	8 22 p.m.
14th „	☾ Last Quarter	11 16 a.m.
22nd „	● New Moon	4 06 a.m.
30th „	☽ First Quarter	8 53 a.m.

Perigee, 9th December, at 11.0 a.m.
Apogee, 25th December, at 5.0 a.m.

When Venus rises as a morning star on the 26th it will again reach its utmost luminosity, shining with even greater brilliance than it did in the middle of October. Since it was in line between the Earth and Sun, 20th November, and invisible, corresponding to "new Moon," it again appears in crescent shape with telescope, still in the part of its orbit nearest the Earth.

On the 27th at 10 a.m. Jupiter will be 6 degrees south of the Moon, but before they set the Moon will overtake the planet and they will disappear about the same time.

At 9 p.m. on the 30th Saturn will be 6 degrees south of the Moon at first quarter, as they are nearing the western horizon.

Between the 22nd and 25th of this month, when no moonlight interferes, Saturn should be in a good position to observe, with telescope, its wonderful ring-system which is opening out; a fascinating sight, so entirely different from anything else in our solar system.

Mercury rises at 6.10 a.m., 1 hour 21 minutes after the Sun, and sets at 8.8 p.m., 1 hour 37 minutes after it; on the 15th it rises at 4.50 a.m., 2 minutes after the Sun, and sets at 6.31 p.m., 10 minutes after it.

Venus rises at 3.46 a.m., 1 hour 3 minutes before the Sun, on the 1st, and sets at 5.16 a.m., 1 hour 15 minutes before it. On the 15th it rises at 2.21 a.m., 2 hours 31 minutes before the Sun and sets at 4.10 p.m., 2 hours 31 minutes before it.

Mars rises at 2.10 a.m., and sets at 3.4 p.m. on the 1st; on the 15th it rises at 1.51 a.m. and sets at 2.48 p.m.

Jupiter rises at 10.32 a.m.. and sets at 11.42 p.m. on the 1st.; on the 15th it rises at 9.47 a.m. and sets at 10.52 p.m.

Saturn rises at 2.13 p.m. on the 1st and sets at 2.9 a.m. on the 2nd.; on the 15th it rises at 1.6 p.m. and sets at 1.3 a.m. on the 16th.

On Christmas-eve at about 9.30 our evening sky is again most luminous with the great northern and southern constellations, in and near the silvery light of the Milky Way.

3rd Jan.	○ Full Moon	7 30 a.m.
12th „	☾ Last Quarter	11 10 p.m.
20th „	● New Moon	11 27 p.m.
29th „	☽ First Quarter	1 0 a.m.

Perigee, 6th January, at 9 p.m.
Apogee, 30th January, at 11 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.